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OBITUARY

We announce with deep regret
the death in Oxford
on 21st December, 1958
of

DR. F. A. BURCHARDT

Director of
The Institute of Statistics
Reader in Economic and Social Statistics
Fellow of Magdalen College

A notice and an appreciation will appear in a later issue of the *Bulletin.*

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ECONOMETRIC FORECASTS FOR 1959

By R. J. BALL, A. HAZLEWOOD AND L. R. KLEIN

Since 1956, a study has been under way at the Institute of Statistics on the preparation of an econometric model of the United Kingdom based on statistical data of the postwar period. This research follows upon similar schemes developed in the United States, Canada, Holland and other research centres throughout the world.

Primary purposes of such statistical models are to reveal in quantitative terms the inter-related structural characteristics of the economy, to assess the effects of alternative policies on the main economic magnitudes, and to predict the level of economic activity. A monograph describing the whole research project in great detail is in the process of being written. Meanwhile, since the statistical work has reached a stage at which it is possible to apply the model to some problems of prediction we are now releasing some computations that may be of interest in discussions of the short run outlook for the economy during 1959.

It requires a complete monograph to explain a system like ours adequately. In this paper we simply present the results of our forecasting calculations, basic assumptions on which the forecasts rest, and an outline of the model. It would require far too much space and time to justify or explain the actual model used. It is the product of three years of research. We do however present the actual model, together with a defining list of included variables, to give the reader an idea of the type of system we are using. A fuller explanation must await the appearance of our prospective monograph.

Two models have been constructed. One is an aggregative system based on annual observations alone. We call this the *prototype* model. Our central objective has been the construction of a larger, disaggregated quarterly model. It is this effort which is outlined below. The prototype model was completed over a year ago and was already used in preparing forecasts for 1958. We are sufficiently encouraged by the results of that application to have again prepared an annual forecast for 1959 from the prototype, as well as quarterly extrapolations from the larger model. The 1958 forecasts were not published but were circulated in a private memorandum last January to government economists, advisers to some Commonwealth governments, and other interested economists in universities, finance, business and international organizations.

The central variable which the model tries to explain is the level of industrial production. As early as last January we forecast a drop of 3.5 index points in this output measure for the year 1958 as compared with 1957. At the same time we predicted a near doubling of unemployment between the two annual periods. Our forecast of a slight drop in earnings and the price level was in error. However, the turning point in activity generally followed the results of our model forecast. A full post-mortem will be made in the forthcoming monograph.

OUTLINE OF THE QUARTERLY MODEL

Variables:

P = Index of industrial production
P_f = Index of production of food, drink, and tobacco manufactures
P_{eb} = Index of production of metals, engineering, vehicles and building industries
P_o = Index of other industrial production
C_f = Consumption of food, drink and tobacco at constant prices
C_s = Consumption of services at constant prices
C_d = Consumption of durable goods at constant prices
C_o = Consumption of other goods at constant prices
p = Price index of total consumption
p_f = Price index of food, drink and tobacco
p_s = Price index of services
p_d = Price index of consumer durable goods
p_o = Price index of other consumer goods
p_k = Price index of fixed assets
E_l = Total civilian labour force
E = Total in civil employment
E_p = Total in industrial employment
E_g = Total in civilian government employment
U = Total unemployment
h = Hours worked per week
w_r = Index of weekly wage rates
w_e = Average weekly wage earnings
W = Wage and salary income in current prices
D = Index of gross company profits
T_w = Tax rate on income from employment
T_d = Tax rate on non-employment income
$T_{d'}$ = Tax rate on company profits
T_i = Rate of net indirect taxation.
S_u = Subsidies on agriculture and food
G_k = Real capital formation by public authorities
G_s = Real expenditures on current goods and services by public authorities
M = Quarterly average holdings of liquid assets
r = Index of yield of debentures
r_b = Bank rate
I = Index of volume of total imports
I_f = Index of volume of food, drink and tobacco imports
I_m = Index of volume of basic materials imports
I_o = Index of volume of manufactured and mainly manufactured imports
X = Index of volume of total exports
X_f = Index of volume of food, drink and tobacco exports

X_e = Index of volume of metals and engineering exports

X_o = Index of volume of other goods exported

$X_\$$ = Value of exports to the dollar area deflated by price index of total exports

X_{er} = Value of exports to O.E.E.C. countries deflated by price index of total exports

$X_{\pounds i}$ = Value of exports to independent sterling area deflated by price index of total exports

$X_{\pounds d}$ = Value of exports to dependent sterling area deflated by price index of total exports

p_i = Price index of total imports

p_{if} = Price index of food, drink and tobacco imports

p_{im} = Price index of basic materials imports

p_{io} = Price index of imported manufactures

p_{met} = Price index of imported non-ferrous metals

p_x = Price index of total exports

p_{xf} = Price index of food, drink and tobacco exports

$P_\$$ = Index of industrial production in the dollar area

P_{er} = Index of industrial production in O.E.E.C. countries

$P_{\pounds i}$ = Production, employment, or deflated exports of the independent sterling area

$P_{\pounds d}$ = Value of exports of dependent sterling area deflated by price index of U.K. exports

$p_\$$ = Index of domestic prices of manufactured goods in the dollar area

p_{er} = Index of domestic prices in O.E.E.C. countries

p_{wf} = Index of world domestic food prices

p_{xc} = Index of export prices of competing countries

$B_{\pounds i}$ = End-quarter sterling balances of the independent sterling area

$B_{\pounds d}$ = End-quarter sterling balances of the dependent sterling area

R = End-quarter gold and dollar reserves as proportion of U.K. imports

P_{wf} = World production (weighted by U.K. food exports)

P_{we} = World production (weighted by U.K. engineering exports)

S_m = End-quarter stocks of imported materials as proportion of materials imports

F = Political factor in wage bargaining $=0$ before 1st January, 1952
$=1$ after 1st January, 1952

J = Factor for status of Northern Rhodesia and Nyasaland
$=0$ before 1st January, 1954
$=1$ after 1st January, 1954

Z = Food de-rationing factor $=1$ in 1954 and 1955
$=0$ in all other periods

t = Time measured in quarter units (101 in 1st quarter 1948, 102 in 2nd quarter 1948, etc.)

Q_{it} = Quarterly seasonal indicator $=1$ in i-th quarter
$=0$ otherwise.

Estimated Equations:

Coefficients have been estimated by the method of *limited information maximum likelihood* from quarterly observations in the period 1948–1956. These become conventional least squares regressions in equations with only one unlagged endogenous variable.[1] In the numerical equations we denote index numbers scaled to 100 in the base year (four quarters) 1948 by the subscript *t*, 0. Estimated sampling errors are in parentheses under coefficients. The goodness-of-fit statistic, R, is adjusted for degrees of freedom. The serial correlation measure is the ratio of mean square successive difference of residuals to the variance. Acceptance of the hypothesis of non-auto-correlated residuals at the 5 per cent significance level requires values in the range 1.4—2.7 for samples of the size being used.

(1) Production function:

$$
\begin{aligned}
(P)_{t,0} = {} & \underset{(10.57)}{-58.71} + \underset{(0.17)}{0.94}\,[(hE_p)_{t,0} + 0.60(I)_{t,0}] + \underset{(0.19)}{0.13}\,(t) \\
& \underset{(1.58)}{-0.97}Q_{1t} \underset{(1.59)}{-3.85}Q_{2t} \underset{(1.57)}{-10.50}Q_{3t}
\end{aligned}
$$

$$R = 0.97 \qquad \text{s.c.m.}^2 = 1.44$$

(2) Production decision equation, food:

$$
\begin{aligned}
(P_f)_{t,0} = {} & \underset{(24.07)}{-17.34} + \underset{(0.28)}{1.09}(C_f)_{t-1,0} + \underset{(0.074)}{0.082}(X_f)_{t-1,0} \\
& \underset{(1.77)}{-9.38}Q_{1t} + \underset{(3.82)}{13.73}Q_{2t} + \underset{(2.49)}{0.56}Q_{3t}
\end{aligned}
$$

$$R = 0.88 \qquad \text{s.c.m.} = 1.66$$

(3) Production decision equation, engineering and building (data from 1952 only):

$$
\begin{aligned}
(P_{eb})_{t,0} = {} & \underset{(13.25)}{57.02} + \underset{(0.12)}{0.18}(G_k)_{t-1,0} + \underset{(0.082)}{0.056}(X_e)_{t-1,0} \\
& + \underset{(0.085)}{0.072}(C_d)_{t-1,0} + \underset{(0.08)}{0.24}\left(\frac{D}{p_k}\ \frac{1}{T_{d'}}\right)_{t-1,0} \\
& \underset{(0.092)}{-0.009}(r)_{t-4,0} \underset{(3.29)}{-0.87}Q_{1t} \underset{(2.18)}{-3.18}Q_{2t} \underset{(1.85)}{-13.32}Q_{3t}
\end{aligned}
$$

$$R = 0.97 \qquad \text{s.c.m.} = 2.66$$

(4) Production decision equation,[3] other manufacturing:

$$
\begin{aligned}
(P_o)_{t,0} = {} & \underset{(6.36)}{-1.18} + \underset{(0.10)}{0.39}(C_o)_{t-1,0} + \underset{(0.06)}{0.41}(X_o)_{t-1,0} \\
& + \underset{(0.05)}{0.32}(G_s)_{t-1,0} \underset{(2.49)}{-9.11}Q_{1t} \underset{(1.57)}{-6.36}Q_{2t} \underset{(1.65)}{-14.16}Q_{3t}
\end{aligned}
$$

$$R = 0.97 \qquad \text{s.c.m.} = 1.95$$

[1] Invaluable computing assistance has been provided by our colleague, Peter Vandome.

[2] Serial correlation measure.

[3] The other equations of the model are estimated on a sample period terminating at the end of 1956. In re-estimating the whole model from a sample continuing through 1957 we have found such an improvement in the formulation of this equation that we have used the results from the later sample.

(5) Consumption function, food:

$$(C_f)_{t,0}=\underset{(18.16)}{33.90}+\underset{(0.079)}{0.238}\left(\frac{W}{p_f}\,\frac{1}{T_w}\right)_{t,0}+\underset{(0.251)}{0.486}\left[\frac{(C_f)_{t-1,0}+\ldots+(C_f)_{t-8,0}}{8}\right]-\underset{(0.89)}{11.92}Q_{1t}-\underset{(0.91)}{7.21}Q_{2t}-\underset{(0.89)}{1.25}Q_{3t}$$

$R=0.96 \qquad$ s.c.m. $=1.56$

(6) Consumption function, durables:

$$(C_d)_{t,0}=-\underset{(16.15)}{59.10}+\underset{(0.21)}{1.49}\left(\frac{W}{p_d}\,\frac{1}{T_w}\right)_{t,0}+\underset{(0.15)}{0.57}\left(\frac{D}{p_d}\,\frac{1}{T_d}\right)_{t,0}-\underset{(0.18)}{0.23}\left[\frac{(C_d)_{t-1,0}+\ldots+(C_d)_{t-8,0}}{8}\right]-\underset{(5.20)}{12.62}Q_{1t}-\underset{(5.08)}{16.67}Q_{2t}-\underset{(5.03)}{17.05}Q_{3t}$$

$R=0.94 \qquad$ s.c.m. $=1.16$

(7) Consumption function, non-durable goods:

$$(C_o)_{t,0}=\underset{(21.71)}{28.96}+\underset{(0.04)}{0.15}\left(\frac{W}{p_o}\,\frac{1}{T_w}\right)_{t,0}+\underset{(0.047)}{0.064}\left(\frac{D}{p_o}\,\frac{1}{T_d}\right)_{t,0}+\underset{(0.27)}{0.58}\left[\frac{(C_o)_{t-1,0}+\ldots+(C_o)_{t-8,0}}{8}\right]-\underset{(1.49)}{15.63}Q_{1t}-\underset{(1.47)}{9.64}Q_{2t}-\underset{(1.47)}{10.32}Q_{3t}$$

$R=0.93 \qquad$ s.c.m. $=0.94$

(8) Consumption function, services:

$$(C_s)_{t,0}=\underset{(1.50)}{77.43}+\underset{(0.01)}{0.18}\left(\frac{W}{p_s}\,\frac{1}{T_w}\right)_{t,0}-\underset{(0.46)}{2.32}Q_{1t}+\underset{(0.46)}{4.96}Q_{2t}+\underset{(0.46)}{10.93}Q_{3t}$$

$R=0.98 \qquad$ s.c.m. $=1.40$

(9) Import function, food:

$$(I_f)_{t,0}=-\underset{(25.71)}{45.27}+\underset{(0.23)}{1.37}(C_f)_{t-1,0}+\underset{(0.030)}{0.028}(R)_{t-2,0}-\underset{(2.84)}{1.30}Q_{1t}+\underset{(3.81)}{14.21}Q_{2t}+\underset{(3.21)}{4.82}Q_{3t}$$

$R=0.70 \qquad$ s.c.m. $=1.17$

(10) Import function, materials:

$$(I_m)_{t,0} = \underset{(23.68)}{21.18} + \underset{(0.11)}{0.85}(P)_{t-1,0} + \underset{(0.035)}{0.025}(R)_{t-2,0}$$
$$- \underset{(0.137)}{0.060}(S_m)_{t-1,0} - \underset{(3.22)}{4.14}Q_{1t} - \underset{(3.13)}{1.99}Q_{2t} - \underset{(3.12)}{2.67}Q_{3t}$$
$$R=0.86 \qquad \text{s.c.m.}=1.82$$

(11) Import function, other goods:

$$(I_o)_{t,0} = -\underset{(18.18)}{93.87} + \underset{(0.14)}{1.86}(P)_{t-2,0} + \underset{(0.053)}{0.066}(R)_{t-2,0}$$
$$+ \underset{(0.16)}{0.19}\left[(P_{met})_{t-3,0} - (P_{met})_{t-4,0}\right]$$
$$+ \underset{(5.09)}{14.17}Q_{1t} - \underset{(4.80)}{4.14}Q_{2t} - \underset{(4.85)}{5.49}Q_{3t}$$
$$R=0.92 \qquad \text{s.c.m.}=1.60$$

(12) Export function, dollar area:

$$(X_{\$})_{t,0} = -\underset{(29.56)}{211.0} + \underset{(0.17)}{2.27}(P_{\$})_{t-1,0} + \underset{(0.24)}{0.91}\left(\frac{P_{\$}}{P_x}\right)_{t-1,0}$$
$$- \underset{(6.78)}{14.80}Q_{1t} + \underset{(7.01)}{0.53}Q_{2t} + \underset{(6.99)}{1.01}Q_{3t}$$
$$R=0.93 \qquad \text{s.c.m.}—=1.86$$

(13) Export function, O.E.E.C. countries:

$$(X_{er})_{t,0} = -\underset{(9.62)}{4.84} + \underset{(0.05)}{0.57}(P_{er})_{t-1,0} + \underset{(0.98)}{0.61}\left(\frac{P_{er}}{P_x}\right)_{t-1,0}$$
$$- \underset{(4.77)}{7.10}Q_{1t} - \underset{(4.75)}{7.50}Q_{2t} - \underset{(4.91)}{16.44}Q_{3t}$$
$$R=0.89 \qquad \text{s.c.m.}=1.22$$

(14) Export function, independent sterling area:

$$(X_{\text{£}i})_{t,0} = -\underset{(49.83)}{31.30} + \underset{(0.34)}{0.90}(P_{\text{£}i})_{t-2,0} + \underset{(0.20)}{0.55}\left(\frac{B_{\text{£}i}}{P_x}\right)_{t-2,0}$$
$$+ \underset{(5.54)}{16.50}(J)_t + \underset{(5.33)}{2.69}Q_{1t} - \underset{(5.32)}{6.52}Q_{2t} - \underset{(5.50)}{8.62}Q_{3t}$$
$$R=0.64 \qquad \text{s.c.m.}=1.26$$

(15) Export function, dependent sterling area (4 quarters, 1951 ii—1952 i, omitted):

$$(X_{\text{£}d})_{t,0} = \underset{(16.39)}{27.42} + \underset{(0.14)}{0.19}(P_{\text{£}d})_{t-3,0} + \underset{(0.23)}{0.74}\left(\frac{B_{\text{£}d}}{P_x}\right)_{t-3,0}$$
$$- \underset{(10.44)}{29.60}(J)_t - \underset{(5.72)}{8.83}Q_{1t} - \underset{(5.83)}{15.32}Q_{2t} - \underset{(5.72)}{13.52}Q_3$$
$$R=0.86 \qquad \text{s.c.m.}=1.85$$

(16) Export function, food:

$$(X_f)_{t,0} = \underset{(45.14)}{-35.21} + \underset{(0.12)}{0.71}(P_{wf})_{t-3,0} + \underset{(0.54)}{0.95}\left(\frac{P_{wf}}{p_{xf}}\right)_{t-3,0} \underset{(6.72)}{-13.55}Q_{1t} \underset{(6.76)}{-18.60}Q_{2t} \underset{(6.77)}{-22.70}Q_{3t}$$

$$R=0.81 \qquad \text{s.c.m.}=1.40$$

(17) Export function, engineering:

$$(X_e)_{t,0} = \underset{(9.80)}{18.31} + \underset{(0.07)}{0.94}(P_{we})_{t-1,0} \underset{(3.95)}{-4.35}Q_{1t} \underset{(3.95)}{-6.08}Q_{2t} \underset{(3.95)}{-12.53}Q_{3t}$$

$$R=0.91 \qquad \text{s.c.m.}=1.58$$

(18) Wage bargain equation, wage rate:

$$(w_r)_{t,0} - (w_r)_{t-4,0} =$$

$$\underset{(1.41)}{10.26} \underset{(0.013)}{-0.091}\left[\frac{(U)_{t,0}+(U)_{t-1,0}+(U)_{t-2,0}+(U)_{t-3,0}}{4}\right]$$

$$+\underset{(0.09)}{0.85}\left[\frac{(p_{t,0}-p_{t-4,0})+(p_{t-1,0}-p_{t-5,0})+(p_{t-2,0}-p_{t-6,0})+(p_{t-3,0}-p_{t-7,0})}{4}\right]$$

$$+\underset{(0.40)}{2.90}(F)_t + \underset{(0.57)}{0.10}Q_{1t} + \underset{(0.57)}{0.30}Q_{2t} + \underset{(0.57)}{0.19}Q_{3t}$$

$$R=0.93 \qquad \text{s.c.m.}=1.02$$

(19) Wage-drift equation, earnings-rate spread:

$$(w_e)_{t,0} - (w_r)_{t,0} = \underset{(45.80)}{-272.72} + \underset{(0.54)}{2.06}(h)_{t,0} + \underset{(0.15)}{0.62}\left(\frac{P}{hE_p}\right)_{t,0} + \underset{(0.96)}{0.001}Q_{1t} + \underset{(0.98)}{1.58}Q_{2t} + \underset{(1.36)}{5.54}Q_{3t}$$

$$R=0.93 \qquad \text{s.c.m.}=0.73$$

(20) Mark-up equation:

$$(p)_{t,0} = \underset{(13.03)}{35.65} + \underset{(0.01)}{0.42}(w_e)_{t,0} + \underset{(0.03)}{0.22}(p_i)_{t-2,0} + \underset{(0.161)}{0.013}(T_i)_{t,0} + \underset{(0.50)}{0.94}Q_{1t} + \underset{(0.50)}{2.06}Q_{2t} + \underset{(0.50)}{1.18}Q_{3t}$$

$$R=0.996 \qquad \text{s.c.m.}=1.16$$

(21) Hours worked equation:

$$(h)_{t,0} = \underset{(0.78)}{91.37} + \underset{(0.006)}{0.085}(P)_{t,0} \underset{(0.21)}{-0.12}Q_{1t} + \underset{(0.21)}{0.11}Q_{2t} + \underset{(0.22)}{0.79}Q_{3t}$$

$$R=0.92 \qquad \text{s.c.m.}=1.04$$

(22) Price formation equation, food:

$$(p_f)_{t,\,0} = \underset{(21.24)}{154.94} + \underset{(0.10)}{0.11}(p_{if})_{t-2,\,0} - \underset{(0.12)}{0.68}(S_u)_{t,\,0}$$

$$+ \underset{(2.04)}{3.23}(Z)_t - \underset{(2.26)}{2.52}Q_{1t} + \underset{(2.20)}{1.42}Q_{2t} + \underset{(2.18)}{0.40}Q_{3t}$$

$$R=0.95 \qquad \text{s.c.m.}=0.58$$

(23) Price formation equation, consumer durables:

$$(p_d)_{t,\,0} = \underset{(7.45)}{49.50} + \underset{(0.09)}{0.34}(p)_{t,\,0} + \underset{(0.02)}{0.15}(p_{met})_{t-2,\,0}$$

$$+ \underset{(1.56)}{2.23}Q_{1t} + \underset{(1.56)}{1.55}Q_{2t} + \underset{(1.56)}{1.54}Q_{3t}$$

$$R=0.95 \qquad \text{s.c.m.}=0.63$$

(24) Price formation equation, other consumer goods:

$$(p_o)_{t,0} = \underset{(1.53)}{16.25} + \underset{(0.02)}{0.78}(p)_{t,\,0} + \underset{(0.006)}{0.054}(p_{im})_{t-2,\,0}$$

$$+ \underset{(0.42)}{0.31}Q_{1t} - \underset{(0.42)}{0.76}Q_{2t} + \underset{(0.42)}{0.32}Q_{3t}$$

$$R=0.99 \qquad \text{s.c.m.}=1.14$$

(25) Price formation equation, capital goods:

$$(p_k)_{t,\,0} = \underset{(1.67)}{55.92} + \underset{(0.02)}{0.33}(w_e)_{t,\,0} + \underset{(0.01)}{0.12}(p_{met})_{t-2,\,0}$$

$$- \underset{(0.78)}{1.96}Q_{1t} - \underset{(0.78)}{1.24}Q_{2t} - \underset{(0.78)}{0.14}Q_{3t}$$

$$R=0.99 \qquad \text{s.c.m.}=1.62$$

(26) Price formation equation, exports:

$$(p_x)_{t,\,0} = \underset{(5.90)}{4.86} + \underset{(0.09)}{0.45}(p)_{t,\,0} + \underset{(0.06)}{0.53}(p_{xc})_{t-2,\,0}$$

$$+ \underset{(1.62)}{0.83}Q_{1t} - \underset{(1.62)}{0.78}Q_{2t} - \underset{(1.61)}{0.32}Q_{3t}$$

$$R=0.97 \qquad \text{s.c.m.}=0.64$$

(27) Price formation equation, food exports:

$$(p_{xf})_{t,\,0} = \underset{(11.57)}{26.63} + \underset{(0.09)}{0.75}(p_x)_{t,\,0} + \underset{(3.64)}{2.17}Q_{1t} + \underset{(3.63)}{2.89}Q_{2t}$$

$$+ \underset{(3.63)}{3.27}Q_{3t}$$

$$R=0.80 \qquad \text{s.c.m.}=0.55$$

(28) Liquidity preference equation:

$$\begin{aligned}(r)_{t,0} = {} & \underset{(21.46)}{120.20} + \underset{(0.06)}{0.29}(r_b)_{t,0} \\ & - \underset{(0.18)}{0.52}\left[\frac{M}{0.79(W)_{t,0}+0.21(D)_{t,0}}\right]_{t,0} \\ & + \underset{(0.55)}{2.54}\,(p_{t,0} - p_{t-4,0}) + \underset{(3.25)}{0.92}Q_{1t} - \underset{(3.29)}{3.99}Q_{2t} \\ & - \underset{(3.25)}{1.67}Q_{3t}\end{aligned}$$

$$R=0.93 \qquad \text{s.c.m.}=0.66$$

(29) Labour supply function:

$$\begin{aligned}(E_1)_{t,0} = {} & \underset{(0.76)}{84.61} - \underset{(0.003)}{0.029}\left[\frac{(U)_{t,0}+(U)_{t-1,0}+(U)_{t-2,0}+(U)_{t-3,0}}{4}\right] \\ & + \underset{(0.005)}{0.18}(t) - \underset{(0.14)}{0.38}Q_{1t} - \underset{(0.14)}{0.34}Q_{2t} - \underset{(0.14)}{0.12}Q_{3t}\end{aligned}$$

$$R=0.99 \qquad \text{s.c.m.}=0.52$$

(30) Non-industrial labour supply function:

$$\begin{aligned}(E-E_g-E_p)_{t,0} = {} & \underset{(3.17)}{67.54} + \underset{(0.03)}{0.35}(E_p)_{t,0} \\ & - \underset{(0.009)}{0.022}\left[\frac{(U)_{t,0}+(U)_{t-1,0}+(U)_{t-2,0}+(U)_{t-3,0}}{4}\right] \\ & - \underset{(0.25)}{0.60}Q_{1t} + \underset{(0.25)}{0.23}Q_{2t} + \underset{(0.25)}{0.87}Q_{3t}\end{aligned}$$

$$R=0.95 \qquad \text{s.c.m.}=0.68$$

Identities and Technical Definitions:

$$\begin{aligned}(31)\ (D)_{t,0} - 4.763\,[8.5644+0.8875(pP)_{t-1,0}]+3.76(W)_{t-1,0} & \\ = 37.27-53.56Q_{1t}-62.93Q_{2t}-46.75Q_{3t} &\end{aligned}$$

$$(32)\ (P)_{t,0} = 0.10(P_f)_{t,0}+0.43(P_o)_{t,0}+0.47(P_{eb})_{t,0}$$

$$(33)\ (I)_{t,0} = 0.40(I_f)_{t,0}+0.20(I_o)_{t,0}+0.40(I_m)_{t,0}$$

$$\begin{aligned}(34)\ (p)_{t,0} = {} & 0.44(p_f)_{t,0}+0.10(p_d)_{t,0}+0.33(p_o)_{t,0} \\ & +0.14(p_s)_{t,0}\end{aligned}$$

$$\begin{aligned}(35)\ 0.04(X_f)_{t,0}+0.50(X_e)_{t,0}+0.46(X_o)_{t,0} = {} & 0.06(X_{\$})_{t,0} \\ & +0.40(X_{er})_{t,0}+0.44(X_{£i})_{t,0}+0.07(X_{£d})_{t,0}\end{aligned}$$

$$(36)\ (W)_{t,0} = 7.58+0.94(w_eE)_{t,0}$$

$$(37)\ (U)_{t,0} = 18.07(E_l)_{t,0}-17.21(E)_{t,0}$$

FORECASTS FOR 1959[1]

To use this estimated set of statistical equations for purposes of prediction, we insert lagged values of variables, referring to observational data of prior time periods, into the equations for 1959 i and 1959 ii. At the same time, we also insert values for government-controlled policy variables such as tax rates, expenditures, subsidies, and bank rate. Overseas levels of activity or prices are also inserted on the basis of a general survey of foreign markets. We then solve the equations simultaneously for the remaining unknown variables. These are our forecast values. They rest firmly on our assumptions which are set out in tabular form below (Table I).

Our forecast solutions are not, however, a purely mechanical result of the substitution of values from Table I into the equation system. A few of the equations have never been satisfactorily estimated, even within the sample period, and others have obviously wandered off their course in very recent quarters. We have made adjustments for such evident biases before using the system in forecasting 1959 i and ii. Equation (22) for estimating food prices and (31) for relating profits to the wage bill are not sufficiently reliable at this stage to be used in extrapolation. In the case of profits our index, based on *The Economist* tabulations, is actually an indicator of a lagged moving total; therefore, we have a fair basis for assigning current values to our index in the forecast quarters.

Our estimates of the index of hours worked has recently been running too high, that of unemployment too low, that of employment too low, and that of the wages bill too low. Equations (21), (30), (36) and (37) have all been adjusted upward or downward by their errors in recent quarters, when estimated and observed data are both available.

With these adjustments, our assumptions of Table I, and the numerical equation system, we have computed the forecast values in Table II. These values are *not* adjusted for seasonal variation and should be so interpreted. They show the predicted level of industrial production to be under the value for the first quarter of 1958 and not rising between the first two quarters of 1959. The drop in this year is probably just more than a seasonal fall. Unemployment is expected to continue to be large in both of the first two quarters of this year.

The forecasts based on the adjustments made in the index of wage and salary income suggest a large rise in purchases of consumer durables over corresponding quarters of 1958, which we consider to be realistic. As in the results from our annual model, mentioned below, we probably underestimate the levels of wage rates, earnings, and prices even after having adjusted the pertinent equations of the model. At best, we expect stable, not falling values of these indices.

In this brief summary, we shall not take up the great detail of all the variables of our model. We have made forecasts for this system only for the first two quarters of 1959. At the same time, however, we have extrapolated the prototype annual model forward for the entire year 1959. In that calculation we have made the following assumptions: a very small drop in export volume (about 1.5 per cent on 1958), a ten per cent cut in tax rates, a two per cent rise in import prices, a bank rate of 3½ per cent, a two per cent rise in real government expenditure, and a one per cent rise in the stock of cash balances. The end result of these assumptions applied to the annual model is a rise of the production index back to the 1957 annual average with a level of unemployment of about 600,000 at a mid-year average. Total real consumption is estimated to be up by about 3 per cent and real inputs by about 4 per cent.

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[1] For the record, we point out that these forecasts were available by Dec. 16th, 1958.

If the annual forecast is set alongside the quarterly pattern for the first half of the year, we should judge that production will continue its present decline into the early part of the year and then recover during the latter half. The yearly average is not expected to come up to the trend growth from which the recession has sagged. Unemployment will probably increase further during the first part of 1959 but not decline much, if at all, later in the year, because the output increase is not sufficiently strong to overcome the effects of increasing productivity.

We have tried as much as possible to describe our results as 'expected to be', 'probably will be', or 'are about', and not as precise numerical values that we think will be reached. Our results are subject to error—sampling error, error of unexplained variability, error of assumptions, and error of specification of the statistical model. We hope, however, that they provide a useful set of quantitative results that will, *on repeated application*, be approximately correct a large percentage of the time and particularly at turning points, such as occurred during 1958.

TABLE I

Values of Exogenous and Other Predetermined Variables Assumed in Forecasting the First Two Quarters of 1959

Variable	1959 i	1959 ii	*Comment*
$(C_d)_{t-1,0}$	(228.0)		These and other lagged variables below are developed in the solution of the first quarter forecast as predetermined variables to be used in the second quarter forecast.
$(C_f)_{t-1,0}$	(125.0)		
$(C_o)_{t-1,0}$	(144.0)		
$(X_e)_{t-1,0}$	(166.0)		
$(X_f)_{t-1,0}$	(185.0)		
$(X_o)_{t-1,0}$	(110.0)		
$(D)_{t-1,0}$	(178.0)		Gross company profits marked down 4 per cent, on the basis of most recent company results, on the index values of the same quarters of previous year.
$(D)_{t,0}$	(160.0)	(170.0)	

$(G_k)_{t-1,0}$	(165.0)	(167.0)	Public sector real capital formation about 4 per cent higher than the same quarter of previous year, on the basis of recent statement by Chancellor of Exchequer.
$(G_s)_{t-1,0}$	(146.0)	(150.0)	Public current expenditure in real terms running slightly below level of the same quarter of previous year, but rising currently.
$(r)_{t-4,0}$	176.9	171.9	
$(p_k)_{t-1,0}$	(154.0)		Assumed rise in price of fixed assets over the same quarter of previous year, but not of the same order of magnitude as increases in previous years.
$(T_w)_{t,0}$	(96.0)	(96.0)	Some reduction in the rate of tax on wage and salary incomes is assumed. (This and the other tax rates are annual, ***calendar year***, not quarterly series.)
$(T_d)_{t,0}$	(92.0)	(92.0)	Virtually no change in tax rate on property income, in the absence of positive information.
$(T_{d'})_{t-1,0}$	(80.0)	(80.0)	Tax payments plus allocations to tax reserves by companies as a proportion of gross company profits, down 3 per cent on average for 1958 on basis of change in tax structure.
$(P)_{t-1,0}$	(137.5)		
$(P)_{t-2,0}$	(126.0)	(137.5)	
$(R)_{t-2,0}$	(111.7)	(112.5)	Marginal rise in gold and dollar reserves as proportion of last eight quarters imports, as terms of trade stabilize. In the light of more recently available data, it can be seen that the values of this variable used in the forecast were set too high. The correct value for $R_{t-2,0}$ in 1959 is 103.4.
$(S_m)_{t-1,0}$	(79.4)	(79.4)	Stocks of raw materials assumed steady on average, at roughly the same level as in the same quarter of the previous year. This implies some fall in stocks in the latter half of 1958.
$(p_{met})_{t-2,0}$	155.9	(150.0)	Imported non-ferrous metal prices in 1958 held up by rise in copper prices.
$(p_{met})_{t-3,0}$	147.5	155.9	
$(p_{met})_{t-4,0}$	150.4	147.5	
$(E_g)_{t,0}$	(92.4)	(92.4)	Civil Service Employment assumed steady around 1958 level.
$(w_r)_{t-4,0}$	(166.1)	(166.7)	

$\frac{1}{8}\sum_{i=1}^{8}(C_d)_{t-i,0}$	(202.5)		
$\frac{1}{8}\sum_{i=1}^{8}(C_o)_{t-i,0}$	(127.5)		
$\frac{1}{8}\sum_{i=1}^{8}(C_f)_{t-i,0}$	(115.9)		
$\sum_{i=1}^{3}(U)_{t-i,0}$	(480.0)		
$(p)_{t-4,0}$	141.5		
$\sum_{i=1}^{3}(p_{t-i,0}-p_{t-i-4,0})$	(4.2)		
$(p_i)_{t-2,0}$	116.7	(115.0)	General import price level marked down slightly from 1958 iii–1958 iv.
$(T_i)_{t,0}$	(100.0)	(100.0)	Indirect taxes plus subsidies as a proportion of consumers' expenditure, marked down about 4 per cent on average for 1958 due to purchase tax cuts, in 1958, and expected slight fall in subsidies.
$(p_{im})_{t-2,0}$	133.3	(128.0)	Imported raw material prices assumed to decline further from 1958 iii–1958 iv.
$(p_{xc})_{t-2,0}$	(143.0)	(143.0)	Slight rise in export prices in competing countries in line with slight increases in domestic price levels.
$(P_{\$})_{t-1,0}$	(141.5)	(142.0)	Slight advance in index of industrial production in the dollar area as the U.S. eases out of the recession.
$(p_{\$})_{t-1,0}$	(110.8)	(110.8)	Stable wholesale price level in the dollar area.
$(P_{er})_{t-1,0}$	(220.0)	(212.0)	Industrial production in Europe, excluding U.K. running about 5 per cent below 1958 same-quarter levels as exports to primary producers fall off. 1958 iv is seasonally high.
$(p_{er})_{t-1,0}$	(140.0)	(141.1)	Stable wholesale price level in the O.E.E.C. area.
$(P_{£i})_{t-1,0}$	(117.0)	(116.0)	
$(B_{£i})_{t-2,0}$	(70.0)	(68.0)	Assumed further reductions in sterling balances of independent sterling area countries in latter half of 1958.
$(P_{£d})_{t-3,0}$	(149.0)	(140.0)	

$(B_{£d})_{t-3,0}$	(230.0)	(228.0)	
$(p_{wf})_{t-3,0}$	(130.0)	(130.0)	Slight rise in world domestic food price in first half 1958.

Note. Numbers in parenthesis are based on judgement or on incomplete data. All values are seasonally *unadjusted.*

TABLE II

Forecast Values of Principal Endogenous Variables

Variable	*1957* (i-iv *av.*)	*1957* (i)	*1958* (i)	*1958* (ii)	*1958* (iiii)	*1959** (i) (*a*)	*1959** (i) (*b*)	*1959** (ii) (*a*)	*1959** (ii) (*b*)
$(P)_{t,0}$ ...	138.5	142.0	142.3	135.7	126.5	139.7	—	135.4	136.8
$(I)_{t,0}$ ...	138.5	142.4	136.8	133.6	137.0	136.2	—	137.2	—
$(X)_{t,0}$ ...	146.3	148.3	144.8	137.3	139.2	141.2	—	135.2	—
$(U)_{t,0}$ ...	103.0	123.6	137.6	145.0	146.4	189.0	—	187.2	—
$(p)_{t,0}$ ...	138.2	136.5	140.8	142.5	141.4	138.7	—	137.3	—
$(w^r)_{t,0}$ ...	162.5	158.1	166.5	167.0	168.5	166.8	—	163.2	—
$(w^e)_{t,0}$ ...	179.7	174.2	184.3	186.0	185.8	185.1	—	179.7	—
$(C_d)_{t,0}$ ...	187.6	172.5	191.1	203.5	191.7	204.3	225.6	203.0	236.7
$(C_o)_{t,0}$ ...	127.3	116.4	124.5	129.9	125.6	117.7	119.7	124.6	127.9
$(C_f)_{t,0}$ ...	115.6	107.2	109.5	115.6	119.9	110.6	113.4	115.2	119.7

Notes. Estimates in columns 1959 (i) (a) and 1959 (ii) (a) have been obtained without any adjustment to the wages bill in equation (36). This gives a downward bias in consumption. Estimates in columns 1959 (i) (b) and 1959 (ii) (b) are those obtained after adjusting the level of wage and salary income. The level of wage and salary income was fixed at 1959 (i) = 209, 1959 (ii) = 213, where 1957 (i) = 183.9.

Starred columns indicate forecast values.

All variables are seasonally *unadjusted.*

The values of some variables in this Table are slightly different from those assigned to them in Table I. This is because the latest available revised values have been inserted in this Table, whereas the values actually used in the prediction have been inserted in Table I.

The values for 1958 iii have become available since the forecasts were made, and could not be taken into account in the forecasting.

THE REASONS GIVEN FOR STRIKING

AN ANALYSIS OF OFFICIAL STATISTICS, 1945—1957

By WILLIAM McCARTHY

For over seventy years the government has published estimates of the 'Principal Causes' of strikes. Each year the *Ministry of Labour Gazette* contains a table which lists the number of stoppages, and the number of workers directly involved, as a result of seven different causes. Considering the amount of discussion which has arisen from time to time, concerning the origins of industrial unrest, little systematic analysis of this material has been undertaken. The object of this article is to attempt such an analysis of the period 1945–1957.[1]

One possible reason why the official statistics have been neglected may be the belief that they are essentially suspect. It is sometimes suggested that the whole idea of selecting and isolating the 'principal cause' of a dispute is misconceived. It is possible to argue that any one of a multiplicity of influences has caused a series of strikes. For example, many of the strikes which took place in the years immediately before the first world war have been related to the repeal of the Taff Vale Judgement, or the spread of revolutionary syndicalism; just as the relative increase in strikes since 1953 has been partially explained by reference to the removal of controls, and the increase in luxury expenditure, which has created a situation in which 'social restraints, far more important than legal restraints, are losing their force'.[2] Then again, one can always interpret strikes as being in some way 'fundamentally' caused by still more general considerations—such as the trade cycle, or bad social conditions, just as one can attempt to explain any particular strike in sociological terms, speaking of 'tensions', or 'motivations', or 'indulgency expectations', etc.[3]

Since none of these factors has any place in the system of classification used by the Ministry of Labour it is possible to argue that nothing but confusion can result from attempts to use the official statistics in order to 'explain' strikes. But such an attitude cannot be maintained once one appreciates what the Ministry's sevenfold classification actually represents. In fact the list is wrongly named. It is not an objectively compiled list of the principal causes of industrial unrest. One assigns causes to strikes according to one's personal bias or predilections. A Marxist will draw up one list, and an industrial psychologist another. If the Ministry's classifications were nothing more than a series of personal pigeon holes, selected by some long dead civil servant according to the matrix of his own prejudices, it would be no more acceptable than any other random classification. In fact it is something more precise than this, and something more interesting. It is a classification of strike statistics according to the main or ' principal ' reasons most frequently cited by those involved at the time.

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[1] The outstanding exception here is, of course, K. G. J. C. Knowles in '*Strikes—A Study in Industrial Conflict*', Blackwell, 1952. Some of the arguments set out in that work will be examined in this article. For the moment, however, it need only be mentioned that Mr. Knowles was primarily concerned with the period 1911–1947, and with making broad comparisons within that period. As a result he used no figures later than 1947.

[2] *Strikes*, by H. A. Clegg, *The Political Quarterly*, January—March, 1956.

[3] See '*Wild-cat Strike*', by Alvin W. Gouldner, Routledge and Kegan Paul, 1955.

This becomes obvious once one considers how the statistics are compiled. The only data available at the time are the speeches and writing of those involved, together with any comment which the conciliation officers and arbitrators may wish to make upon them. It is from these accounts that the officers of the Ministry of Labour must determine their classification. It is from these that they must abstract a more or less commonly agreed reason for the stoppage. Of course there is often more than one reason cited. Then, as the Gazette admits, the strike must be classified according to ' what appears to be ' the main or principal reason. Naturally strikes sometimes arise as a result of two or more grievances in circumstances in which it is almost impossible to say which is the most important. This may result in a situation in which the official's choice of the ' principal ' reason determines the classification of the strike. In these cases the Ministry officials can only be guided by the form which the argument takes. They may think that underlying the talk about wages there lie wider grievances, they may be convinced that a dispute which is outwardly an argument concerning the right to a particular class of work is actually motivated by the desire to maintain real income. But their selection of categories cannot be influenced by such inferences. They must classify the strike according to the only objective data available, and these are the reasons given for it by those most closely involved.

The sevenfold classifications available to the officials at this point are as follows:

(1) Claims for Increases in Wages.
(2) Other Wage Disputes.
(3) Hours of Labour.
(4) Employment of Particular Classes or Persons.
(5) Other Working Arrangements, Rules and Discipline.
(6) Trade Union Status.
(7) Sympathetic Action.

Each and every dispute must be fitted, or forced, into one of these categories, so that before a final verdict can be delivered upon the utility and significance of the tables which result it is necessary to know what is included in each of them. Unfortunately most of them are not self-explanatory, and the footnotes which seek to elucidate them are far from comprehensive. One footnote informs us that category (4) ' *includes e.g. demarcation disputes; for reinstatement of discharged or suspended employee(s); disputes arising from employment of certain officials* '. While another states that category (6) ' *includes e.g. refusal of trade union members to work with non-unionists* '. However, we are not informed of the other kinds of disputes ' *included* ' in (4) and (6), and we are told nothing about the sorts of strikes classified under

(5) or (2). The only category exhaustively defined is (7) i.e. '*in support of workers involved in stoppages at other establishments*'.[1]

Fortunately it is possible to obtain further clarification by consulting the long out of print 1913 *Report on Strikes and Lockouts*.[2] This publication contains a fuller list of twenty or more classifications from which the seven published causes of to-day are compiled, together with examples of a large number of disputes and their appropriate classification. With its aid it is possible to ascertain the sorts of disputes which are included in each of the seven categories. Using Tables I and II, which have been compiled from statistics published in the period 1945–1957, and by reference to Graphs I and II which accompany them, it is possible to go further and discuss the relative importance of each of the categories in the period since the war. Let us take each of these in turn.

(1) *Claims for Increases in Wages*

This is by far the most straightforward classification and it is virtually self-explanatory. Since 1945 it has accounted for 9.2 per cent of the total number of stoppages and some 42.3 per cent of workers directly involved. Graph I, however, shows that on two occasions a considerably larger proportion of workers on strike were said by those involved to have withdrawn their labour as a result of disputes over increases in wages. In 1953 84 per cent of all workers directly involved came into this category, while in 1957 the figure was 72.6. Yet in both cases this abnormal increase was largely due to the effects of one particular strike in the engineering industry. The first was a one day token strike which involved over a million workers, the second was the recent national engineering and shipbuilding stoppage which accounted for over 600,000. These two instances apart the number of workers involved in stoppages as a result of wage increase disputes appears to be relatively constant in each year since the war, while the percentage of the total workers directly involved has usually been in the region of 20 per cent. Moreover, if one measures the effect of wage increase disputes on the total number of stoppages per year there would appear to be even less variation. On average this category has accounted for about 9 per cent of all stoppages, and in no single year has it been given as a principal reason for as much as 13 per cent; only a relatively stable minority of disputes since the war have been justified principally by reference to the demands of workers for increases in wages.

(2) *Other Wage Disputes*

Unfortunately this category is by no means as unambiguous as (1) above. Until a few years ago it was the practice to sub-divide the wages categories into three—strikes for increases, strikes against decreases and other strikes about wages. Presumably because for some years there were virtually no

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[1] *Ministry of Labour Gazette*, May, 1958, page 170.

[2] *Report on Strikes and Lockouts*, 1913, Cd. 7658, pp. 173–8. Ministry officials have assured the writer that the categories outlined in this publication still form the basis of present day classification.

TABLE I

Principal Causes of Disputes Leading to Stoppages of Work in the Period 1945–1957

Cause	*Total No. of Stoppages*	*% of Total*	*Workers Directly Involved*	*% of Total*	*Average No. of Workers per Stoppage*
Wages:					
Claims for Increases ...	*2,382*	*9.2*	*2,944,100*	*42.3*	*1,236*
Other Wage Disputes ...	*9,299*	*36.0*	*1,294,400*	*18.6*	*139*
All Wage Disputes ...	11,681	45.2	4,238,500	60.9	363
Hours of Labour	820	3.2	259,100	3.7	316
Employment of Particular Classes, etc.	3,227	12.5	791,300	11.4	245
Other Working Arrangements	9,172	35.5	1,049,300	15.1	115
Trade Union status ...	567	2.2	174,200	2.5	307
Sympathetic Action ...	245	0.9	347,900	5.0	1,420
Other[1]	125	0.5	94,100	1.4	753
All Classes	25,837	100	6,954,400	100	269

[1] This category was dropped in 1952. It represented miscellaneous disputes not easily classified under other headings and was never very large.

Small stoppages involving fewer than 10 workers and those which lasted less than one day are excluded from the statistics, except any in which the aggregate number of working days lost exceeded 100.

Source: *Ministry of Labour Gazette*, 1945–1957. Annual article on Stoppages of Work due to Industrial Disputes.

TABLE II

Total and Average Number of Working Days Lost as a Result of the Principal Causes of Disputes in 1957[1]

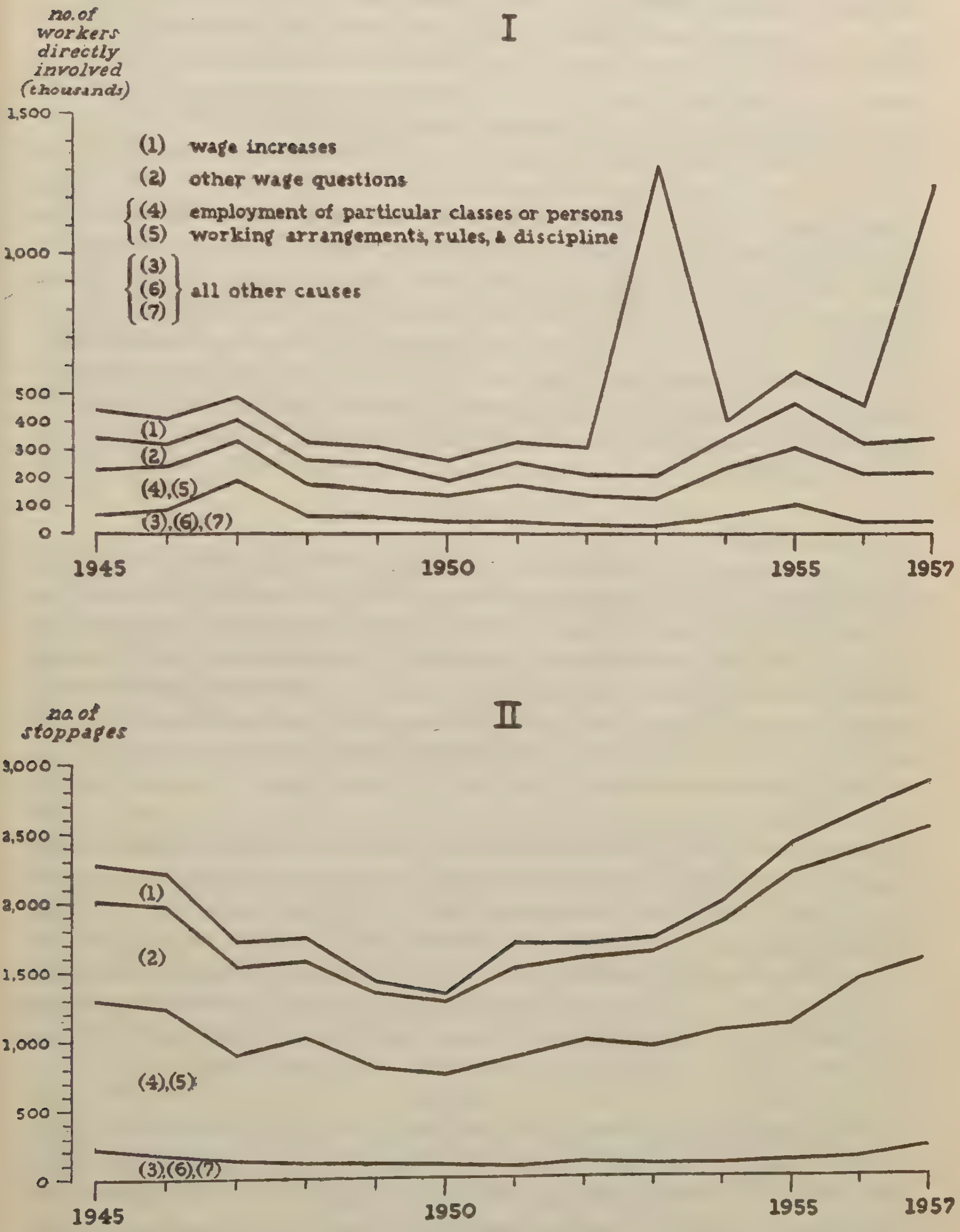
Cause	*Total Working Days Lost*	*% of Total*	*Average No. of Working Days Lost per Stoppage*
Wages:			
Claims for increases	*7,160,000*	*85.2*	*21,896*
Other Wage Disputes	*327,000*	*3.9*	*351*
All Wage Disputes	7,484,000	89.1	5,851
Hours of Labour	31,000	0.4	264
Employment of Particular Classes or Persons	341,000	4.1	1,258
Other Working Arrangements, etc.	405,000	4.8	425
Trade Union Status	62,000	0.7	984
Sympathetic Action	73,000	0.9	3,173
All causes	8,399,000	100	2,937

[1] Earlier figures of this sort are unfortunately not available.

Small stoppages involving fewer than 10 workers and those which lasted less than one day are excluded from these statistics, except any in which the aggregate number of working days lost exceeded 100.

Source: *Ministry of Labour Gazette*, 1957, Annual article on Stoppages of Work due to Industrial Disputes.

Workers involved, and numbers of stoppages according to principal causes of disputes, 1945-57



strikes arising out of the attempts of employers to reduce wages, the second category was merged with the third.

'*Other wage disputes*' originally contained merely disputes concerning systems of wage payment. That is to say those which arose principally out of attempts to substitute time for piece-work, or introduce payment by results, etc. Also included were disputes where the principal argument concerned the readjustment of rates, demands for the payment of guaranteed minimums, extra pay for bad work, etc. Present day strikes principally aimed at securing payment for holidays are also classified under this heading.

It is difficult to draw significant conclusions from the figures in this category, even if one assumes that there are still very few wage decrease strikes contained within it. Nevertheless it is worth attempting to make some sense out of the figures, if only because Table I shows that they constitute a substantial proportion of the total. Since the war 36 per cent of all disputes come into this category, and even in terms of workers involved they have accounted for some 18.6 per cent. Of additional use here would be an industrial breakdown of this group; as the figures stand one can only infer that it is probably within strike prone industries, such as mining, engineering and shipbuilding, where there is considerable piece work, that this category is most important.

(3) *Hours of Labour*

This category is comparatively unimportant. There was a time when separate figures were published showing strikes *for* decreases in hours, as opposed to those *against* increases. These are now all grouped together and strikes against the introduction of night shifts or refusals to work overtime are all counted in with strikes concerning starting and leaving times and the introduction of a shorter working day. Altogether, however, they have never accounted for more than 4 per cent of stoppages, and on an average only 3.7 per cent of workers involved. The only year since the war when the pattern was broken was in 1947, as can be seen from Graph I. A glance at the Ministry's list of major disputes for that year reveals that there were at that time a number of strikes aimed at securing a reduction of hours in road haulage, together with a fairly widespread strike for the five day week in the ship building industry. These two issues account substantially for the fact that in 1947 this category included 18.5 per cent of workers directly involved in stoppages. Since that date one may conclude that very few British workers have been prepared to strike over reasons concerned with attempts to reduce hours of working.

(4) *Employment of Particular Classes or Persons*

This category, together with the one that follows, is both ambiguous and interesting. Both categories are statistical rag-bags. The 1913 Report lists a whole series of widely disparate disputes which have, from time to time, been included within it. It is obvious from this list that the three examples given in contemporary footnotes are incomplete if not misleading. There seem to be no less than six separate types of dispute included. They are:

(1) Demarcation disputes.

(2) Disputes concerning the reinstatement of workmen.

(3) Disputes arising out of the employment of foremen, supervisors, etc., who are objected to for various reasons.

(4) Disputes concerning claims to promotion or re-employment after redundancy.

(5) Refusals to negotiate or recognise more than one trade union.

(6) Disputes as to which of two or more trade unions a worker should join.

The last three are not mentioned in the published footnotes, while it is arguable that the last two might equally well have been included in category (6). As in the case of category (2) the apparently diverse nature of the kinds of strikes included in this group makes it seem difficult at first to draw many conclusions from it. Yet the accompanying tables show that it is a relatively important one. In terms of workers involved this group has been responsible for 11.4 per cent of the total since 1945, while in terms of stoppages it has resulted in some 12.5 per cent of the total. Its full importance, however, can only be gauged after a consideration of category (4), with which it is closely allied.

(5) *Other Working Arrangements, Rules and Discipline*

The 1913 Report lists a whole series of disputes which are classified under this heading. The list includes strikes for ' the abolition of certain machines ', objections to ' new engagement forms ', or the ' use of a pneumatic elevator '. Also contained are disputes arising out of the use of certain materials, or the working of gangs, etc. At first glance this category looks like an index of Luddism, but in fact it appears to have been designed to provide a home for two quite distinct types of dispute which it unfortunately classifies together. These are:

(1) Disputes arising out of attempts to change the conditions of employment not covered by categories (2) and (3) above, i.e. alterations in systems of working which do not involve changes in methods of payment or hours.

(2) Disputes arising out of attempts to impose discipline not covered by category (4) i.e. disciplinary issues which do not involve reinstatement, or attempts to secure the removal of foremen, etc.

The need for the first of these is evident once it is realised that there are bound to be disputes in which workers will be trying to resist or advocate some proposal to change their methods of working which does not take the form of an alteration in the system of payment or hours[1]; a pigeon hole must be found for these. Similarly, some issues of discipline give rise to disputes which affect workers generally rather than particular classes of workers and these must be put somewhere too. That this residual role was intended for category (5) is made clear by its old title, which has since been abbreviated but which is given in full in the 1913 report. It runs:

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[1] So called ' cup of tea ' strikes and similar minor disputes would be included in this group.

> ' Working Arrangements, Rules and Discipline—Other than the above.'

Unfortunately this residual appears to be the single most important group affecting post-war stoppages of work. It has accounted for 35.5 per cent of all strikes. It is less important as a reason given for numbers of workers directly involved, since it only accounts for 15.1 per cent, yet in certain years it has been relatively more important. Moreover, taken with category (4), which it in some ways resembles, it appears to be even more significant—since between them these two groups have accounted for 26.5 per cent of all workers involved and 48 per cent of all stoppages. It is here, surely, that the case for some re-classification of the *Gazette* statistics is most strong. Again what would be desirable would be a much fuller breakdown, if possible industry by industry. In the absence of this is it possible to make any meaningful use of these two groups?

One attempt to do this for the years 1911–1947 was made by K. G. J. C. Knowles.[1] Knowles grouped categories (4) and (5) together as '*frictional*' causes, and compared them with two other groups of categories over various periods since 1911. These he termed '*basic*' causes—i.e. categories (1), (2) and (3), and '*solidarity*' causes—i.e. categories (6) and (7). He found that ' Strikes on basic questions have declined in relative importance, and strikes on frictional issues have correspondingly increased '.[2] He also found that there was a very marked decline in wage increase strikes, expressed as a percentage of all strikes, and a particularly marked increase in strikes about working arrangements rules and discipline. From this he concluded that the character of strikes had perceptibly changed over the period 1911–1947. Strikes had come to be caused less by so-called '*basic*' factors, which directly involved economic questions, such as wages or hours of working, and more by so-called '*frictional*' issues such as amenities, or lack of consultation, etc.

It is clear from our two tables that this trend has continued. Knowles found that the percentage of strikes over ' basic ' issues had fallen from 69 per cent in the period 1911–1925 to 54 per cent in the period 1927–47. Taking the post-war period as a whole we can see that it has dropped to 48.5 per cent. Similarly while in the two periods he compared '*frictional*' strikes rose from 22 per cent of the total to 39 per cent, in the years since the war '*frictional*' strikes have risen to 48 per cent. The two groups are now virtually the same size. Even inside the groups the trend continues relatively unchanged. Claims for wage increases have fallen to less than 10 per cent of all stoppages, while other working arrangements now account for over 35 per cent.

In one respect only have the trends noted by Knowles been reversed; the total number of workers directly involved as a result of all '*basic*' issues has actually risen slightly since the figure of 60 per cent for the period 1927–1947. Over the whole of the post-war period it stands at 64.6 per cent. This is still some 10 per cent less than the corresponding figure for 1911–1925, and as we have seen it is largely the result of two isolated engineering disputes.

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[1] Knowles, *op. cit.*, pp. 234–6.

[2] Knowles, *op. cit.*, p. 235.

It would consequently appear that categories (4) and (5) can be used significantly in order to illustrate the changing character of strikes and the increasing relative importance of so-called '*frictional*' issues.

Can any further conclusions be drawn from the continued growth in the importance of these groups? Let us reconsider the sorts of strikes that are included within these two categories; demarcation disputes, strikes over unjustified dismissals, objections to the behaviour of charge-hands, attempts on the part of unrecognised unions to recruit members, poaching disputes, sudden removals of established privileges, etc. One of the characteristics which *all* these disputes have in common is resentment at an assault upon established customs and practices which the group is quick to defend—if need be with a strike. Of course this is not to deny that there may often be good economic reasons for such resentment—as in the case of demarcation disputes—but this is not the point. As we have seen these classifications should be primarily regarded in terms of the reasons given for striking. So that what is significant, in the continued rise in the relative importance of categories (4) and (5), is the indication given that more and more British workers are tending to justify their withdrawals of labour in terms of what Burke would have called their 'acquired rights'. Or as they themselves would put it; in terms of 'the custom and practice of the trade'. No doubt Marxists, industrial psychologists, and others will be able to explain this, according to their own general theories of strike determination. What we have to record is that categories (4) and (5) can be regarded as a rough index of the process.

(6) *Trade Union Status*

What this category is an index of is not at all clear. A reading of the 1913 Report shows that it is made up of at least three widely different disputes only one of which is mentioned in contemporary footnotes. These are:

(1) Disputes arising out of attempts to eliminate non-unionists.

(2) Disputes concerning attempts to secure trade union recognition, or certain facilities for union activity—*e.g.* the right to send round collectors, etc.

(3) Disputes concerned with alleged victimisation of trade unionists *as* trade unionists—*e.g.* the removal of shop-stewards, etc.

The category is not a large one, and it has only accounted for 2.2 per cent of all stoppages, and 2.5 per cent of all strikers in the period since 1945. These figures show the declining relative importance of this category, which in the years just before the second world war accounted for just under 10 per cent of strikes and strikers. In some ways the group is linked to (4) and (5) above, in that many stoppages probably occurred as a result of the defence of various acquired rights—for example the 'right' not to have to work with non-unionists. In other ways the group can be regarded as an indication of attempts to acquire new rights—such as recognition, or a closed shop, the latter being by far the most important since the war. In its present form, however, it is difficult to say which movement it represents on balance, so that little can be done with it.

(7) *Sympathetic Action*

This group seems to be more straightforward than it is. It is defined as 'in support of workers involved in stoppages at other establishments.' The 1913 *Report* lists a number of examples of this; ' refusal to handle goods belonging to certain firms involved in a dispute ', ' because of a rumour that a steamer was loading coal for a port where a strike was in progress ', etc. This gives the impression that the category includes only ' blackleg ' strikes, in fact it embraces any stoppage of work in support of another group's grievances, whether blacklegging is involved or not. Nevertheless the group is not a very large one, involving less than 1 per cent of all stoppages since 1945 and a mere 5.0 per cent of workers. The only year since the war when a substantial number of workers justified their withdrawal of labour by reference to this category was in 1947, when category (7) accounted for some 20 per cent of all strikers. Then, as we have seen, there was an upsurge of strikes in favour of reductions in hours, and some of these received the sympathetic support of the dockers. This somewhat unusual trend helped to swell Knowles ' ' *solidarity* ' category, but in fact since that date they have declined, as a glance at graphs I and II makes clear.

Conclusions

We have now completed our survey of the Ministry's sevenfold classification of strikes according to their ' Principal Causes ' and must attempt to draw some general conclusions from this analysis.

Firstly, it seems fairly clear that significant use can be made of these statistics. As a classification of the reasons given for striking they appear to be basically sound. What they need is further refinement rather than any radical alteration of existing categories. Ideally what would be best would be a return to the pre-1914 practice of classifying strikes according to the twenty odd causes mentioned above, allied to the present method of supplying separate statistics for the 48 industrial groups in the standard industrial classification. If this could be done for total stoppages, workers directly involved and aggregate number of working days lost, it would help in answering a whole series of interesting questions. For example, it would then be possible to tell which industries are most troubled by demarcation disputes; where disciplinary problems are most likely to result in strikes; what groups of workers resist the introduction of time and motion study, or are most concerned with problems of redundancy, etc. At the moment only the larger strikes which are justified by reference to these issues are reported, and while most students of industrial relations could make a number of more or less shrewd guesses concerning the nature and extent of the many other strikes in these categories, a further refinement of Ministerial statistics would provide much more information on which to base such inferences. Indeed it seems possible to argue that information of this sort, by focusing attention existing centres of unrest, might even help in suggesting ways of avoiding certain stoppages. If such a radical extension of the published figures is out of the question in these days of government economy then one would put in a plea for almost any further refinement even of the most inexpensive sort. If it is at all helpful to suggest priorities then it seems clear that a further refinement of groups (4) and (5) is needed most of all. The published figures for these groups should surely at least allow one to distinguish between demarcation disputes, strikes concerned with various disciplinary issues, and strikes which are really justified by reference to the right to organise and recruit workers into particular unions. At the moment, as we have seen, these three types of strikes are either mixed together in a single composite category, or are distributed amongst one or another of two different categories.

Turning from the possibilities of improving the statistics: what have they revealed to us of the pattern of post-war industrial disputes? In summary we found that many, though not all, of the trends observed by Knowles in the period 1911–1947 continued into the period 1947–1957—although sometimes a rather different construction was put on these trends. Graphs I and II indicate the relatively constant influence of most categories over the post-war period and Tables I and II show that large scale official wage disputes aside, the great majority of workers who have struck since the war have not justified their withdrawals of labour by reference to simple wage issues. Nor have they put forward as a reason the need to reduce hours of working, or the closed shop, or a desire to support other workers in dispute.

The reasons which workers have used can be grouped under three broad headings. They are:

(1) arguments concerning changes in the system of payment

(2) arguments concerning changes in other working arrangements

(3) arguments concerning alleged assaults on what are termed the customs and practice of the trade.

Now it is clear that these three groups, which have accounted, in most years, for some 80 per cent of stoppages and some 70 per cent of workers involved, have much in common. In a sense they are all examples of the continued importance of what we have termed acquired rights. That this is so in the case of (2) and (3) above has already been argued; but even in the case of strikes which arise out of changes in the system of payment there must surely often be a sense in which it is acquired rights which are at stake. After all, in present circumstances, most changes in the system of payment, which involve the introduction of time and motion methods, or the introduction of new ways of fixing rates, or devices for reducing scheduled overtime, etc., are usually initiated by the employer because it is believed that existing methods of payment have led to ‘ featherbedding ’ or ‘ restrictive practices ’.

But from the workers' point of view these practices may not be regarded in this way. It may seem to them that what is at stake are certain long established rights or privileges, and so their reason for striking takes the form of an appeal to such rights.

Another general conclusion which may be drawn from the above analysis concerns the average size of most strikes in the period 1945–57. These can be found by dividing the number of strikes in any group by the number of workers involved and are set out in Table I. This table indicates the relatively localised nature of most strikes since the war. Apart from the wage increase strikes, and the relatively few sympathetic strikes, most other groups have an average of under 300. In the important categories (2), (4) and (5) the average is 108 workers involved in each strike. Unfortunately it is not possible to estimate the average number of working days lost in these strikes, because until last year there were no figures available. However, the 1957 table did contain a breakdown of working days lost according to the seven classifications used and in Table II these have been used to arrive at the average number of working days lost per strike in each category during 1957. Assuming that 1957, apart from the engineering and shipbuilding wage increase strike is a typical post war year, these figures demonstrate once again the limited nature of post-war strike activity.[1] Wage increase and sympathetic strikes would appear to be the most drawn out type of dispute, accounting for an average of 21,896 and 3,173 working days respectively. Those two aside most strikes tend to be relatively short, the combined average of groups (2), (4), and (5) being some 678 working days.

In other words the average dispute in these categories is one which involves about 100 workers and lasts about a week. Loosely what emerge from these statistics are two very different stereotypes. Since the war most strikers have approximated to one or another of them. Either they have been taking part in a somewhat prolonged and relatively widely based (usually 'official') strike, justified by reference to the fact that a group of employers had refused to concede a nationally negotiated wage increase—for example the engineering and shipbuilding stoppages of 1953 and 1957, the engine drivers' and fireman's strike of 1955, or the dispute between London Transport and the busmen in 1958. Or, they have been taking part in a strike (usually 'unofficial'), along with a limited local group, and have tended to justify their refusal to work by reference to some unpopular proposal for change, or threat to established customs and practices. In this case a settlement will probably have been effected within a week.

As we have seen in most years since the war the first stereotype—the 'official' wage striker—has appeared but infrequently, whereas the second —the 'unofficial' defender of acquired rights—has put in a more or less constant appearance in markedly similar numbers each year. These facts are at least worth remembering when considering proposals for the avoidance of industrial unrest—particularly those which over-emphasise the role which is played by national leadership.[1]

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[1] In fact the 'curve' of total working days lost as a result of all causes, which can be compiled from published figures for each year since the war, follows the 'curve' of the total number of strikes for the same period very closely. This would seem to indicate that generalisations about the whole of the post-war period which are based upon the 1957 breakdown of working days lost by causes may not be wholly inaccurate.

Which of our two stereotypes will predominate in the next ten years is a matter of conjecture. Just as the 'underlying' or 'fundamental' causes for the emergence of either of them is a task for any economist or sociologist who thinks he can explain these things. All that this article has set out to do is to show that the 'Principal Cause' tables of the Ministry of Labour can be analysed in such a way that they furnish material which enables us to reach meaningful conclusions concerning the reasons men actually give for striking. Presumably any general theory of strike determination will have to take such factors into account.

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[1] See '*The Challenge of Employee Shareholding*', by George Copeman, Batsford, 1958, for the latest example of this perennial error.

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SOME INTERNATIONAL COMPARISONS OF CONSUMERS' DURABLE GOODS

By F. Knox

A comparison of numbers of consumers' durable goods in use in different countries is of interest for a number of purposes. Governments and manufacturers may wish to have some estimate of probable future demand in home and foreign markets; it is generally assumed that if living standards continue to rise, the demand for consumers' durables in the poorer countries will approach that of the advanced countries at present. International comparisons in this field are also of direct interest in comparing standards of living. As opposed to basic necessities—food, housing and clothing—consumer durables rank with ' inessentials ' like entertainment on which, according to Engel's hypothesis, individuals and nations spend an increasing proportion of their income as they become richer.

In this article levels of ownership in thirty-two countries of motor cars, motor cycles, telephones, radio sets, television sets, refrigerators and washing machines are compared for 1957. The sources are: motor cars: ' *The Motor Industry of Great Britain*' published annually by the Society of Motor Manufacturers and Traders; motor cycles: unpublished figures provided by the British Cycle and Motor Cycle Industries Assocn., Ltd.; telephones: '*The World's Telephones* ', published by the American Telephone and Telegraph Co.; radios: ' *World Radio Handbook* ', published by O. Lund Johansen, Copenhagen; television sets, ' *Television in Britain* ', published in March, 1958, by Political and Economic Planning; (P.E.P.'s figures were in turn derived from the ' *World Radio Handbook* ' and information from a number of embassies.) For refrigerators and washing machines no single source of information exists and figures have been obtained from embassies, government statistical offices and trade organisations of the countries concerned.

International comparisons of this kind are almost inevitably subject to a larger margin of error than comparisons over time within a single country, through differences in definition and methods of compilation. For refrigerators and washing machines the sources vary from a complete census in New Zealand and a sample census in Canada and Sweden to private market research enquiries in Belgium, Great Britain, Japan, the Netherlands and West Germany. In some cases where no estimates of numbers in use could be obtained the figures used are totals of annual sales from 1949 to 1957; this was done for Austria, Czechoslovakia, Ireland and Norway. This method ignores depreciation and scrapping of durable goods and will result in an under-estimate where sales before 1949 were substantial; there is however reason for believing that, except possibly in the U.S.A., Britain and the Dominions, sales of refrigerators and washing machines before 1949 were relatively small. In France a poll was taken of household equipment in 1954 and the figures here were obtained by adding to the 1954 figures annual sales for 1955, 1956 and 1957. The rapidity of change in this sector in many countries is illustrated by the fact that in these three years the number of refrigerators and washing machines in use in France both doubled. In many countries television in 1957 was still in an experimental stage. No country except perhaps the U.S.A. had had television for long enough to judge what the final density of receivers was likely to be. Figures for radio sets are in two non-comparable forms; number of licences issued, and estimated number of receivers in use. In the Union of South Africa, Argentina, Brazil, Canada, Mexico, the U.S.S.R. and Venezuela, figures refer to estimated number of receivers in use. For all other countries the figures are of licences. The second group will of course emerge unduly low in a comparison with the first, though the discrepancy will only be serious in high standard of living countries where more than one radio set per household is common.

The numbers in use of the different commodities were divided by population figures for each country for 1957, as given in the *United Nations Demographic Yearbook for* 1958. For many purposes a comparison of numbers per household would no doubt be preferable, but accurate and up-to-date figures of households are not generally available. A summary of the results is set out in Table I, in which the countries are ranked according to motor cars per 100 of population. In all items except motor cycles the U.S.A. heads the list. Canada is second in three items (cars, radios and washing machines), and third in one (telephones); New Zealand is third in cars and fourth in telephones and washing machines; Australia is second in refrigerators and fourth in cars; Sweden is second in telephones and third in radios, refrigerators and motor cycles. In motor cycles West Germany leads with Austria second.

Compared with the United Kingdom the U.S.A. has eight times as many refrigerators proportionately to population, four times as many motor cars, more than twice as many radios, telephones and washing machines and one and a half times as many television sets. The United Kingdom is in fifth place for radio, sixth for television and motors cars, eighth for motor cycles, ninth for washing machines and telephones and thirteenth for refrigerators. The figures for radio sets in the U.K. here are those of sound and television licences combined, as nearly all homes with television also have facilities for sound reception.[1]

Table II shows percentage increases between 1938 and 1957 for cars, radios and telephones per 100 of population. No figures for motor cars, refrigerators and washing machines are available for most countries for the pre-war period, and television was of course almost non-existent. These figures may be misleading unless taken in conjunction with Table I; some of the largest percentage increases are registered by countries in which *per capita* density is still very low. This is the case in India with radios and telephones, and in Greece and Spain with radios. Among the twenty richest countries the largest increases in cars took place in Austria (675 per cent), Sweden (476

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[1] B. P. Emmett, 'The Television Audience in the U.K.', *Journal of the Royal Statistical Society*, December 1956.

TABLE I

Consumers' Durable Goods: Numbers per 100 of Population, 1957

	Motor Cars	*Motor Cycles*[1]	*Telephones*	*Radio Sets*	*Television Sets*	*Refrigerators*	*Washing Machines*
U.S.A.	31.7	0.3	33.7	78.8	25.7	26.5	23.5
Canada	19.5	0.2	26.3	36.2	16.8	17.8	17.3
New Zealand ...	18.8	1.1	25.6	23.5	—	13.2	14.4
Australia	15.8	1.3	18.5	21.8	0.9	19.7	10.4
Sweden	10.5	4.3	31.5	35.0	5.3	18.7	11.9
United Kingdom ...	7.7	2.6	14.0	28.5	16.9	3.7	9.7
France	7.7	4.1	7.8	21.6	13.9	4.9	5.6
Switzerland	6.3	3.1	24.3	25.3	5.3	9.8	3.9
Belgium	5.8	2.3	10.4	22.5	22.2	5.3	15.1
Denmark	5.5	2.8	20.5	31.3	22.2	5.0	4.0
Ireland	4.8	1.0	4.3	16.5	—	1.4	2.0
South Africa ...	4.5	0.2	5.4	5.9	—	3.2	0.9
West Germany ...	4.0	4.8	8.3	27.5	18.9	3.9	4.5
Norway	3.8	2.2	17.8	27.9	—	7.3	11.2
Netherlands	3.3	1.6	11.2	22.7	17.7	1.0	10.4
Austria	2.7	4.7	7.7	26.1	2.1	6.5	3.4
Finland	2.6	1.5	11.3	25.4	0.9	2.8	6.9
Venezuela	2.5	0.2	1.9	3.7	3.1	—	—
Italy	2.1	4.3	5.4	13.2	12.7	2.0	0.6
Argentina	1.7	0.2	5.9	15.1	5.0	—	—
Mexico	0.9	0.02	1.2	5.2	7.7	1.1	0.6
Czechoslovakia ...	0.7	2.6	2.9	22.3	9.8	1.5	6.3
Brazil	0.6	0.05	1.4	5.7	6.7	1.1	0.1
Spain	0.5	0.3	4.1	6.4	0.2	—	—
Greece	0.3	0.1	1.7	6.8	—	—	—
U.S.S.R.	0.2	0.4	—	14.8	14.3	—	—
Japan	0.17	0.6	3.8	15.8	7.0	2.7	0.4
Turkey	0.14	0.07	0.7	5.2	—	—	—
Yugoslavia	0.07	0.09	1.0	3.9	0.3	—	—
India	0.04	0.01	0.08	0.2	—	—	—
Pakistan	0.04	0.01	0.06	0.1	—	—	—
China...	0.007	—	0.05	0.02	—	—	—

[1] *Motor Cycles* includes mopeds.

per cent), Belgium (386 per cent) and Finland (366 per cent.) In radios the largest increases were Italy (574 per cent), Canada (402 per cent), Ireland (319 per cent) and Finland (316 per cent). In telephones the largest increases were Italy (416 per cent), South Africa (318 per cent), Ireland (316 per cent) and Sweden (274 per cent).

One of the distinguishing features of consumers' durable goods is that demand depends to a large extent on the stock of goods already in the hands of consumers. The pattern of demand for such a good in a high income society is likely to be a rapid rate of growth when first introduced with the rate subsequently falling as replacement demand becomes a larger proportion of total demand.[1] A comparison of the North American experience with that of other countries might be expected to thrown some light on this question.

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[1] The concept of a ' saturation point ' is sometimes used to predict demand for consumers' durables. This is open to question on a number of grounds: (1) The life of the equipment cannot be determined independently of economic and social factors; (2) quality changes, if only in minor points, are almost continuous and it cannot be assumed that consumers will regard present and previous models as close substitutes; (3) it is now clear from experience in the advanced countries that certainly for cars, telephones and radio sets and possible also for television sets and refrigerators, the maximum ownership level will be reached at a point considerably higher than one appliance per household; for this reason most predictions have been (from the viewpoint of the manufacturer) unduly pessimistic.

TABLE II

1957 as Percentage of 1938

	Cars	*Radios*	*Telephones*
U.S.A.	169	249	226
Canada	202	402	223
New Zealand	168	131	209
Australia	221	141	215
Sweden	476	179	274
United Kingdom	197	154	211
France	197	183	205
Switzerland	371	193	250
Belgium	386	169	221
Denmark	204	163	191
Ireland	267	319	316
South Africa	161	281	318
West Germany	250	164	156
Norway	260	223	212
Netherlands	333	177	243
Austria	675	253	183
Finland	366	316	240
Venezuela	107	167	319
Italy	300	574	416
Argentina	121	193	226
Mexico	300	289	171
Czechoslovakia	140	319	193
Brazil	238	651	231
Spain	100	582	372
Greece	278	2,000	273
U.S.S.R.	400	403	N.A.
Japan	189	268	211
Turkey	700	193	636
Yugoslavia	66	433	280
India	100	1,000	500

Note. India and Germany—1938 figures for pre-partition territories.

In 1956, of the 49 million households in the U.S.A. 97 per cent owned a radio, 92 per cent a refrigerator, 83 per cent a washing machine and 72 per cent a motor car. In 1954 4.5 per cent of U.S. households (nearly 8 per cent of all car owners) had more than one car. In September 1956, according to a survey carried out by the Dominion Bureau of Statistics, 96 per cent of Canadian households owned a radio set (including 19 per cent who owned two sets, 5 per cent three sets and 2 per cent more than three), 84 per cent owned a washing machine, 80 per cent a mechanical refrigerator, 73 per cent a telephone and 58 per cent a motor car. In mid-1956, according to a survey carried out by the Institute of Practitioners in Advertising, 25 per cent of the households in Britain owned a washing machine, 24 per cent a car, 21 per cent a telephone and 11 per cent a refrigerator.

In the U.S.A. car, radio and washing machine retail sales have been at a high level throughout the post-war period and show no signs of falling off, though refrigerator sales have declined slightly since 1950. In Canada sales of cars, radios refrigerators and washing machines were all in 1950 at more than treble the pre-war rate. Radio, refrigerator and washing machine sales fell off in the years after 1950 but have since regained the 1950 level; car sales have increased almost every year. In Britain, by contrast, car sales in

1950 were at only half the 1938 level and in 1957 were still only 70 per cent. Radio sales fell to less than one-third of 1938 in 1953 and rose to 70 per cent in 1957; washing machine and refrigerator sales, for which figures are not available for pre-war, have shown a fairly steady increase since 1950.

'Saturation' in the sense of appliances owned by nearly 100 per cent of households has so far been approached only in the U.S.A. So far there is little evidence that retail sales in the U.S.A. are increasing less rapidly than in other countries or that demand in the U.S.A. is slackening off, but conclusive evidence on this point can only be expected in a number of years.

Consumers' durable goods and standards of living

The ownership of consumers' durable goods is believed to be closely associated with levels of real income, to such an extent that the first is often taken as a criterion of the second. In so far as the figures in Table I are to be interpreted in terms of comparative welfare in different countries, there are a number of qualifications to be made, apart from the validity of the statistics.

(1) It is not generally possible to make a distinction between government and private ownership; the figures are of totals in use. Cars, motor cycles and telephones may be under bureaucratic or military control; in the latter case they will of course come within the category of 'regrettable necessities' and are not a criterion of consumers' welfare.

(2) Similarly it is not possible, except for cars in certain countries,[1] to obtain a breakdown by institutional and private ownership. No doubt the typical family would prefer a washing machine, television set or refrigerator of its own to the use of one owned commercially or collectively. Nevertheless it is possible that less welfare may be derived from individual ownership; for example in Switzerland nearly all modern apartment blocks of three or more flats have communal laundry rooms which are at the disposal of all tenants by rotation. Such arrangements may eliminate problems of ignorance, indivisibility and excess capacity which arise if each family possesses its own appliance. Television sets owned by clubs, etc. may provide occasion for social gatherings additional to the use of the appliance; similarly with 'launderettes' in Britain. These are clearly imponderables.

(3) For individual commodities, there are a number of obvious qualifications—cold countries have less need of refrigerators, clean countries of washing machines, and highly urbanised countries with well-developed public transport systems have less need of motor cars.

(4) As between cars and motor cycles, and possibly also between radio and television, relationships of substitutability appear to exist with one item as the 'inferior good'. Among the richer countries (from Italy upwards in Table I) there is a clear inverse correlation between car ownership (which is positively correlated with real income) and motor cycle ownership.

In Table III the degree of penetration of the seven main consumers' durables has been compared with two estimates of *per capita* real income in twenty countries, by the United Nations and by Colin Clark.[1] A comparison is also made with estimates of food consumption made by the Food and Agriculture Organisation of the U.N.

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[1] The following percentages of motor cars are estimated to have been in business ownership in 1957: U.S.A. 18, Canada 24, Australia 31, U.K. 25, France 26, West Germany 19, Italy 28, Japan 66.

The U.N. figures are of net national product, defined as the value of goods and services at factor cost after deduction of provision for the consumption of fixed capital. They are based on published figures of national income in national currencies or on estimates made by the U.N. Statistical Office, and are expressed in U.S. dollars. Conversion was carried out by the U.N. by pre-war exchange ratios adjusted for changes in the purchasing power of national currencies by suitable price index numbers.[2] As a result of the problems connected with conversion, there are strict limits to the usefulness of the results as measures of national real income. In Table III the U.N. figures for 1949 and 1954 have been expressed as indices with U.S.A. as 100.

Colin Clark's figures were derived by a more complicated process from a number of indices of real consumption, using a method applied by Dr.M. K. Bennett to pre-war data, and are based on India as 75. In Table III these figures have also been expressed as percentages of the U.S.A. The Clark-Bennett method uses a partially weighted geometric mean of twenty-five consumption indices, *viz.* fibre consumption (weight 5), coal equivalent of fuel and energy consumption (weight 3), number of cattle and draught animals (weight 3), number of sheep and pigs (weight 2), number of passenger cars, number of goods vehicles, number of passenger kilometres travelled on the railways, number of letters posted, number of telegrams, number of telephones, number of doctors, number of hospital beds, newspaper circulation, number of radios, number of primary school pupils, and number of secondary school pupils. Thus three of our durables—motor cars, telephones and radios—are already incorporated in the index.

Initially, it is obvious that no close correlation exists between the different measures of consumption. If we take the figures closest in time, the U.N. figures for 1949 and Colin Clark's for 1950, Switzerland, Australia, Norway, Ireland and West Germany are considerably higher, and New Zealand, the United Kingdom and France lower, in Colin Clark than in the U.N. list. Apart from deficiencies in the data a possible explanation is the exclusion of food consumption from Colin Clark's list; this does not seem to be the answer as the countries which are higher in Colin Clark seem to have a higher *per capita* calorie intake than the countries immediately above them in the U.N. list. Such discrepancies make it improbable that a very close correlation is to be expected between consumer durable density and the measures of general consumption. Neither does there seem to be any regular relationship between

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[1] United Nations Statistical Papers, Series E, No. 4, 1957: '*Per Capita National Product of* 54 *countries in* 1952–1954', and Colin Clark, '*The Conditions of Economic Progress*', 3rd edn., 1957 (figures relating to 1950).

[2] The method of conversion is described in detail in U.N. Statistical Papers, Series E, No. 1, 1950: '*National and Per Capita Incomes of Seventy Countries in 1949.*'

TABLE III

Consumer Durable Goods and Levels of Consumption, Indices, U.S.A. = 100

	United Nations (1954)	United Nations (1950)	Colin Clark (1950)	Food Consumpt'n	Cars	Motor Cycles	Telephones	Radio Sets	Television Sets	Refrigerators	Washing Machines
U.S.A.	100	100	100	100	100	100	100	100	100	100	100
Canada	70	60	80	101	61	88	78	46	61	67	74
Switzerland	54	58	85	100	19	1,252	72	32	20	37	16
New Zealand	53	59	75	109	59	440	76	29	—	49	61
Australia	51	47	62	102	49	504	55	28	4	74	44
Sweden	51	58	56	98	33	1,700	93	44	21	71	51
Belgium	43	40	48	97	18	908	31	29	87	20	85
United Kingdom ...	42	53	42	103	24	1,240	41	17	62	14	41
Denmark	40	47	40	107	17	1,136	61	39	87	15	17
Norway	39	40	53	102	12	880	53	35	—	28	48
France...	39	33	37	92	24	1,644	23	27	54	19	24
Finland	35	23	40	107	9	604	33	32	4	11	25
Venezuela	29	22	—	74	8	68	6	5	12	—	—
West Germany ...	27	22	39	96	12	192	25	35	73	15	19
Netherlands ...	26	34	46	96	11	636	33	29	65	4	44
Argentina	24	24	38	90	5	92	18	19	20	—	—
Ireland	22	29	42	112	15	396	13	21	—	6	9
Austria	20	15	21	90	9	1,884	23	33	9	25	14
Italy	17	16	19	82	7	1,724	17	17	49	8	2
South Africa ...	16	18	24	83	14	88	17	8	—	12	3

the U.N. and Colin Clark measures and food consumption. Ireland, which is well down the U.N. list, has the highest *per capita* calorie intake, while the U.S.A. is eighth in the list of food consumers.

The highest correlations with the U.N. measure are to be found in radios, washing machines and motor cars, where the correlation coefficients are .76, .71, and .68 respectively. The correlation coefficient with telephones was .63, with television .29, with refrigerators .10 and with motor cycles –.31.

Sweden, Norway and Austria are much higher on the scale of refrigerator density than on the U.N. consumption scale; Switzerland is much lower. Sweden, Denmark, Norway and West Germany all have levels of radio ownership higher than their corresponding rank in the U.N. list. Switzerland has noticeably fewer cars than its standard of consumption alone would lead one to expect. In this case the explanation is no doubt to be found in topography. In other cases it is obviously hazardous to attempt explanations without detailed consideration of social habits, income distribution, prices, etc., in the countries concerned. In the U.K. a possible explanation of the low level of cars, refrigerators and washing machines is to be found in purchase tax, which seems to discriminate against consumer durables more strongly than the sales taxes of other countries.

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CAPITAL FORMATION IN NIGERIA AND GHANA

1946–1955

By E. K. Hawkins

The continuing interest shown by economists in under-developed territories has meant that the very inadequate statistical information available for these countries has been much increased. Whilst the extent to which the independent student can add to the stock of basic statistical series is very limited, there has also been an increased official interest in obtaining better information. In the West African territories of Ghana and Nigeria much basic statistical material has become available in the post-war period, following the creation of government statistical departments.

In the course of a study of economic development in Nigeria and Ghana in the first ten years after the war,[1] the writer had occasion to collect together the available statistics bearing on capital formation. The official series do not cover the whole period, so that it was necessary to make estimates for certain years. Such estimates present great difficulties in under-developed territories and they can never be so well founded as is possible in countries with better basic information.[2] It is possible however, to get figures which give the orders of magnitude involved; these, if used with care, can help to illuminate the course of economic development.

Since there is considerable topical interest in African development amongst economists it is thought that there may be some value in publishing the statistics collected. It is not the intention to comment upon their significance here, but details of the sources are given, together with some discussion of the method used for the writer's own estimates.

The years for which these estimates were required were, for Nigeria, 1946 to 1949 inclusive, and for Ghana, 1946 to 1948 inclusive. As a starting point there existed an explanation of a method used for the National Income study in Nigeria for 1950–51.[3] No descriptions have been published of the manner in which the official series are constructed in either country, but, from explanations kindly given to the writer by the authorities, it appeared that the basis of their estimates was also the import statistics. These were supplemented by a wealth of information obtained by direct enquiry and not available to the private investigator.

The basic assumption behind the use of import statistics is that all investment activity is reflected in these figures to some extent, either through the purchase of machinery and equipment of all kinds, or of materials for constructional purposes, particularly items such as cement. It is obvious that this assumption is invalidated at once if there is any manufacture of capital

[1] This work was done at Nuffield College in consultation with Professor S. H. Frankel and financed from a grant made to the College by the Rockefeller Foundation.

[2] See especially: W. I. Abraham—' Investment estimates of under-developed countries: an appraisal ', *Journal of the American Statistical Association*, September, 1958.

[3] A. R. Prest and I. G. Stewart—*The National Income of Nigeria 1950–51*, (London), 1953, pages 70 to 73.

goods or constructional materials within the country. It so happens that this was not the case in West Africa for the first ten years after the war. Apart from the construction of local canoes and some other small boat-building activities, no industrial or transport equipment was constructed within Nigeria and Ghana. There is one big exception to this, for which an allowance can be made; many of the lorries imported in both countries enter as chassis with engines and a locally built body is then added. For construction materials, the situation is not so simple, for it is usual throughout the world for such supplies to be provided locally because of the prohibitive transport costs on such materials. This is particularly important in the case of civil engineering works, which are characterised by a high proportion of labour costs, accompanied by an extensive use of local materials such as sand, rock, laterite, etc. On the other hand, one important raw material for all constructional work—cement—was not produced in either country during these years. It is possible to use this vital raw material import as an indicator of the total value of constructional activities.

The published import statistics for both countries show the value and volume (where possible) of imports in great detail. They also show figures for re-exports and the amount of import duty paid, where applicable. The values recorded relate to the *c.i.f.* landed cost. In principle these values are supposed to be based on the internal prices within the country (although excluding import duty);[1] in practice it is obvious that this cannot be so, since in many cases the importer does not know what these market prices will be at the time of importation. It seems right, therefore, to add to the *c.i.f.* values recorded in the Trade Reports both the duty levied (if any) and a ‘ mark-up ’ to cover the difference between landed prices and final installation costs for the capital good concerned. This ‘ mark-up ’ has to cover, in principle, internal transport costs, distributors margins and any installation costs. The latter ought, in principle, to cover the labour content of the investment expenditure concerned.

The correct determination of this ‘ mark-up ’ presents great difficulties. It is not likely to be the same for every capital good and, unless one is to aim at a level of sophistication which this method does not warrant, the question resolves itself into the problem of fixing upon a reasonable average. After extensive enquiry it was decided to use an average figure of 25 per cent for all capital goods. In the case of cement it was felt that this figure was too low, because of the large element of internal transport costs included in the final selling price of this product.[2] A ‘ mark-up ’ of 50 per cent was adopted, in view of these considerations.

In order to get an estimate for the gross value of building and construction activity the value of cement imports, obtained in the manner already described above, was multiplied by a factor based on the ratio of the cost of cement to the gross value of output. This followed very closely the method used in the Nigerian National Income study.[1] The ratio used was 10 per cent; this was also based on extensive enquiries and is almost the same as that used by Prest and Stewart.

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[1] See, *Annual Trade Reports for Nigeria and (formerly) the Gold Coast.* Also: R. G. D. Allen and J. E. Ely—*International Trade Statistics*, (London), 1953, Chapter 16, page 340.

[2] *Cf.* United Africa Co.—*Statistical and Economic Review*, No. 14, September, 1954, page 37.

The results of these calculations are estimates for gross fixed capital formation under three heads: (*a*) Plant, machinery and equipment, (*b*) Transport—vehicles, ships, aircraft and railway investment and (*c*) Building and construction. In the case of item (*b*) the capital expenditure of the railways can be obtained directly from the published reports and it is superfluous therefore to estimate it indirectly *via* import statistics. An allowance was made for building and constructional work carried out by the railways and this was deducted from item (*c*) to avoid double counting.

In order to test whether the order of magnitude obtained by this method is correct, calculations were made for the first year for which official statistics are available. It was found that it gave estimates that were close to those of the official series.[2]

The most serious difficulty attaching to this method of estimating gross fixed capital formation arises from the need to make some deduction from gross investment for repairs and maintenance. The import statistics include supplies used for all purposes and do not always permit any distinction between those for repairs and maintenance and those for replacement or new additions.

Fortunately, the difficulty can be avoided in the case of item (*b*), Transport, since the import classifications distinguish between the import of whole items of equipment and of parts. Since the assembly of transport equipment from parts is negligible in either Nigeria or Ghana, it can be assumed that all the parts imported are used for repair and maintenance. They are excluded, therefore, from the calculations.[3]

For item (*a*) no such deduction can be made from the information given in the import statistics. Similarly, separate calculations have to be made for the element of maintenance and repair work included in item (*c*). There are additional problems connected with this item, however, which can be taken into account at the same time. One concerns the question of the wastage of cement from breakages and other causes after its importation into the country. It is probably not too conservative to put this as high as 5 per cent,[4] so that the estimate obtained by the method described above will be too high by that percentage from this cause. On the other hand, the estimate for building will neglect any construction which does not use cement as an imported material. Since a large amount of African housing is built of local materials with a ' pan ', or imported corrugated metal roof, this omission could neglect a part of the total investment in buildings. On the whole, however, it is probably not too inaccurate to assume that these two factors cancel out, leaving only the problem of making a deduction for maintenance and repairs.

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[1] Prest and Stewart, *op. cit.*, pages 39–40. The writer was able to confirm the reasonableness of their ratio from official information received in confidence.

[2] It has already been stated above that it is believed that the official statistics use a more sophisticated version of the above method as a basis.

[3] In this respect the method used here departs from that of the National Income study which includes the import of parts. Prest and Stewart, *op. cit.*, pages 71 and 72. The United Kingdom National Income calculations follow the practice of deducting repairs and maintenance from gross investment, but have not always done so. See: *National Income Statistics, Sources and Methods*, (London), H.M.S.O., 1956, page 281. Also: W. I. Abraham, *op. cit.*

[4] It has been suggested to the writer by one West African importing firm that this figure should be regarded as the minimum estimate.

The second main objection to the measurement of capital formation from import statistics lies in the way in which it can omit the investment expenditures of a large number of small scale African enterprises which use little or no imported goods or raw materials. Their capital investment is ' labour-intensive ', and would be reflected in imports, if at all, through consumption goods financed by the ' advances to labour '. Included in this category is the (net) clearance of farm land, African mining enterprises and some miscellaneous workshop activities. It is probably only the first of these that could be of significant size, compared with the types of capital formation that are included by the imports method. At the moment, there is insufficient information with which to judge just how important it is likely to be. The amount of cultivated land in use in Nigeria and Ghana at any one time is relatively small, probably less than 20 per cent of the total land area, and with an agricultural system still based in the main on shifting cultivation, the net increase in the cultivated area may be quite small, even after allowing for the increase associated with the population growth. Apart from investment concerned with bringing more land permanently under cultivation, there is also the question of ' intensive ' investment—changes in the use of land from low value crops to those of higher values. Since the value productivity of West African export products is so much higher than that of the subsistence products, this is of more importance than the ' extensive ' investment already referred to. Once again there is no information which would permit a realistic estimate to be made of the extent of this investment. It will be included to some extent in the estimates obtained from import statistics, since the tools used by farmers for agricultural purposes are included under item (*a*).

These difficulties may be summed up by saying that calculations of the present kind only concern investment expenditures that generate money incomes. In Nigeria and Ghana, which are still emerging from a subsistence economy, there is also investment taking place which increases productive capacity but does not create money incomes. Extensive and intensive changes in agricultural investment are the best examples of this.[1]

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[1] I am indebted to Mr. A. Hazlewood for commenting on an earlier draft of this note.

TABLE I

Nigeria: Summary of capital formation statistics, 1946–55

£ million

	1946	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*
Gross fixed capital formation										
1. Plant, machinery and equipment[1]	1.2	1.5	3.0	4.0	—	—	—	—	—	—
2. Transport	2.4	3.1	5.3	11.0	—	—	—	—	—	—
3. Building and construction[1]	9.1	10.1	12.3	15.1	—	—	—	—	—	—
Main sectors					16.5	21.8	29.9	32.1	35.8	40.8
Other enterprises and personal investment					20.1	14.5	25.8	20.1	24.2	34.3
Total	12.7	14.7	20.6	30.1	36.6	36.3	55.7	52.2	60.0	75.1
Gross fixed capital formation by sectors										
1. Government[1]	2.2	2.5	4.9	10.4	10.0	10.9	13.6	12.8	15.8	20.4
2. Mining Industry	0.4	0.5	0.8	0.9	0.9	2.1	2.5	4.0	4.7	4.1
3. United Africa Co. Group	0.4	0.8	1.1	1.4	1.4	1.7	1.8	1.8	1.5	1.4
4. Unidentified	9.7	10.9	13.8	17.4	24.3	21.6	37.8	33.6	38.0	49.2
Total	12.7	14.7	20.6	30.1	36.6	36.3	55.7	52.2	60.0	75.1

Sources: See notes to this Table.

[1] Excluding railways.

NOTES TO TABLE I, NIGERIA

Gross Fixed Capital Formation

1. Figures for the years 1946 to 1949 are estimates made by the writer from import statistics, in accordance with the Note above. They include, under item 2, Transport, figures for the Railway which were obtained from the Annual Reports of the Nigeria Railway and refer to a financial year ending March 31st.

2. An official series of estimates begins in 1950, but it is published in such a way as to make it impossible to show it in a form comparable with that for the earlier years. The series is published in the *Digest of Statistics* (Lagos) and comprises two main items, ' Main Sectors ' and ' Other enterprises and personal investment '. The former is defined as covering Governments (Federal, Regional and Local), public corporations and the major commerical establishments. The latter sector appears to be a residual item.

Gross Fixed Capital Formation by Sectors

1. Governments, 1946–49, estimated by the writer from the Government Accounts and refers to a financial year ending the March 31st. 1950–52: from the report of the International Bank mission, *The Economic Development of Nigeria* (Lagos), 1954, Appendix D, Table I. 1953–55: estimated by the writer from the *Digest* with the aid of confidential information on the breakdown of the item ' Main Sectors '.

2. Mining Industry. Figures obtained from a separate study of the industry made by the writer. 1946–49: estimated from a large sample of Company Reports, 1950–55 obtained from the *Digest*.

3. United Africa Co. Group. Obtained from the publication *Statistical and Economic Review*, issued by the U.A.C. (London). Figures refer to a financial year ending August 31st; *e.g.* figure shown for 1946 refers to 1945–46 financial year.

TABLE II

Ghana: Summary of capital formation statistics, 1946–55 *£ million*

	1946	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*
Gross fixed capital formation										
1. Plant, machinery and equipment[1]	1.4	2.1	3.0	3.7	3.6	4.3	4.6	5.3	5.1	5.7
2. Transport	0.6	1.8	4.0	3.3	4.5	5.3	6.4	8.1	8.2	9.5
3. Building and construction[1]	6.5	6.9	10.6	7.8	6.0	8.8	13.2	13.5	16.0	16.7
4. Other investment in agriculture, mining and industry	*	*	*	1.6	1.6	1.5	1.4	1.9	2.5	3.5
Total	8.5	10.8	17.6	16.4	15.7	19.9	25.6	28.8	31.8	35.4
Gross fixed capital formation by sectors										
1. Government	1.0	1.4	1.7	2.7	3.9	5.7	9.8	10.4	13.0	13.7
2. Railway and harbours	0.1	0.3	0.4	1.1	1.4	2.3	2.3	2.8	4.1	4.3
3. Mining Industry	0.5	1.1	1.2	1.3	2.7	2.1	2.1	1.9	1.6	1.4
4. United Africa Co. Group	0.1	0.2	0.6	0.9	1.1	0.8	0.8	0.6	0.4	0.6
5. Unidentified	6.8	7.8	13.7	10.4	6.6	9.0	10.6	13.1	12.7	15.4
Total	8.5	10.8	17.6	16.4	15.7	19.9	25.6	28.8	31.8	35.4

[1] Excluding railway and harbours.

* Not known separately.

Sources: See notes to this Table.

NOTES TO TABLE II, GHANA

Gross Fixed Capital Formation

1. The estimates for 1946–48 were made by the writer from import statistics, in accordance with the above Note. Railway and Harbours capital expenditure were obtained from the Annual Reports of the Administration, except that, for 1946, when no report was published, they were calculated from import statistics.

2. The figures for 1949 are constructed from calculations made by Dudley Seers and C. R. Ross in the *Report on financial and physical problems of development in the Gold Coast* (Accra), 1952, Appendix A. These refer to the financial year 1949–50, ending March 31st, 1950. Railway and Harbours capital expenditure was again obtained from the annual reports.

3. From 1950 onwards the statistics come from Appendix I of the *Economic Survey 1955*, (Accra), 1956, 'National Income and Expenditure 1950–55 '. This contains detailed tables for capital formation and the sources of its finance, but no definitions or explanations are given of the method of construction. This is due to the fact that these are provisional estimates which will be revised in time; however, ' . . . the general order of magnitude of the various aggregates is not likely to be changed significantly '. (Foreword to *Economic Survey 1955*) One difficulty is that it is impossible to reconcile the figures given for investment in railways and harbours in the Survey with the published figures of the railway administration. No satisfactory explanation could be obtained as to the reason for this. This differences are substantial, the Survey figures being larger than those of the railway Annual Report. The former series has been used in Table II above.

Gross Fixed Capital Formation by Sectors

1. Government. Estimated by the writer from the Government Accounts for the years 1946–49. Figures refer to a financial year ending March 31st. 1950–55 from *Economic Survey 1955*, Appendix I.

2. Mining Industry. Obtained from a similar study to that made for Nigeria for the years 1946–49. 1950–55 from Table 14, page 31, *Economic Survey, 1955*.

3. Railway and Harbours. Sources as described above.

4. United Africa Co. Group. See notes to Table I above.

MEASURING PRODUCTIVITY IN THE ABSENCE OF RECORDS

By LLOYD R. AMEY

One novel feature of the renewed interest in Productivity since the War has been the greater attention paid to the micro position: the individual firm and even plant have come in for much closer scrutiny.

The present paper is concerned with one of several intensive case studies[1] in single manufacturing firms, designed to measure the yearly changes in productivity, among other things, over a period of some 25 years. It will be seen that these studies were more long-range than most.

Our purpose in this paper is not to present the conclusions of such a study, but rather to report on some of the problems encountered and the methods used to deal with them. How does one measure labour productivity when the requisite data (such as physical output, average employment or hours worked) are not on record? Indeed, if this be the situation why should one bother?

For several reasons it was hoped that the period of the studies could be extended back to the year 1930. It was realised, of course, that in so doing difficulties of measurement and limitations imposed by availability of records within the firms would be raised in acute form. The typical firm, in our experience, keeps very few records going back as long as 25 years. Some will never have recorded the particular information most vital to the productivity investigator, and available data will seldom be in the form he requires.

Such conditions are rather discouraging to the research worker, and the reader may well ask why we bothered to proceed with a firm in which the essential records were known to be non-existent, more especially in view of the period of the study. There are two answers. First, the number of firms who are willing to allow an outsider free access to all their records is limited; of these a number often change their minds once the full implications of the disclosure dawns on them. Among the panel of firms co-operating with us two happened to be in the same industry; we knew also that one had expanded and the other contracted (in terms of value of turnover) during the period 1930–1950s. An investigation of one had been completed—not without complications—before the firm here referred to was visited. A comparison of these two ' similar ' firms was considered likely to prove fruitful.

Secondly, we can say more generally that to confine productivity comparisons (or other studies for that matter) to those firms which have records may not always be the most profitable course to follow. Research is not always less worthwhile because the results it yields are largely negative; often the difficulties encountered make the study more interesting rather than less. Furthermore, one should be careful not to equate availability of records and elaborate organisation with efficiency of the firm, as the present case demonstrates.

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[1] These were made possible by a grant under the Conditional Aid Scheme for the use of Counterpart Funds derived from U.S. Economic Aid.

The illustrations that follow serve to show, *via* output and input, what can be done with an unpromising situation. If we may draw an analogy with crime detection, what happened during most of the fateful evening remained unaccounted for when the evidence of all the witnesses had been pieced together, and the search for clues began entirely without promise. Secondly, the extent of the retreat from purism—both conceptually and statistically—will be all too apparent; this was largely due in the present case to the need to make long-range comparisons, but might in general have been dictated by lack (or paucity) of data or by expediency.

Since very few long-range productivity studies in single firms have been undertaken to our knowledge, two general observations may be of interest. The first is that the Nottingham research, while it involved gargantuan labours in collecting the data and carrying out necessary computations, did justify our early hopes that it would bring to light some significant influences on productivity which are often missed or obscured in more extensive studies. A full account of one of the case studies has already been published,[1] and it may be possible to present the others later.

The other point is a methodological one. Even where statistical records exist one is still forced to use oral evidence, with the risk of being misled.[2] In seeking the explanations of certain situations (or confirming a ' hunch ') we had to fall back on the staff of the firm for whatever clues they might be able to provide; in other cases the information in question was unsolicited. The frequency with which we were given, in good faith, information which on analysis proved to be false or misleading was rather alarming. For this there were a number of causes, among them difficulties of communication, rationalizations, genuine memory errors and plain muddled thinking.

Our first illustration of lack of data concerns the measurement of production. Before the War, we were told, this textile firm had produced 40 to 50 different lines a year, each in a range of sizes and possible colours. During the War, a considerable degree of standardisation (and simplification) was enforced by the Utility Scheme (though firms were allowed to produce a certain percentage of non-Utility goods). With the introduction of the ' D ' Scheme in 1952 the laying down of a set of standard specifications for a considerable range of products came to an end (the ' D ' Scheme amounted merely to a modified basis of Purchase Tax assessment). The result was a tremendous proliferation of styles—this firm's product range grew to about 800—which was in line with what the market had come to expect before the War, and was an important form of competition between firms. In addition to this the firm sold some intermediate products to the trade and undertook Government contracts.

Now it is one thing to measure such a heterogeneous output, when the product range is constantly being reshuffled, when there are changes in quality and prices (both absolute and relative), and when—as we found in the case of the other firm in this industry—even the specification of a given product (as given by a fixed code number) could not be accepted with impunity. This would be quite enough to contend with, especially when it is remembered that if it is to be used to calculate productivity changes, the production index must be highly accurate—otherwise it may seriously upset the order or even the direction of the change.

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[1] F. A. Wells, *Productivity in a Printing Firm'*, 1958 (Duckworth).

[2] See I. F. Pearce and L. R. Amey, ' Price Policy with a Branded Product ', *Review of Economic Studies*, Vol. XXIV, No. 1.

Preliminary inquiries, however, left doubts as to whether the investigation could begin at all in this instance. No details of physical output were available, and sales records and price-lists had not been retained very far back. But on making a reconnaissance several old cost books were discovered; the firm had apparently forgotten their existence. Together with more recent cost records, these showed estimated prices and prices actually charged as well as cost details. And in the absence of physical quantities production could only be measured by deflating Sales and Stocks from the annual accounts of the firm.

But here a rather Gilbertian situation arose, in that not a single entry in the old cost books was dated! Products were identified by consecutive numbers but there was no indication where one year (or season) ended and the next began. The staff could offer no help beyond turning over the tattered pages and occasionally remarking ' Oh, we were producing *that* around 1928 ', or ' that is Mr. X's handwriting, so *that* must be 1936 or later '.

There were 3,500-odd of these undated entries. A further snag was that virtually all the entries were in pencil; many had been erased and re-entered —or merely altered—as products had been recosted. Successive pages (and product numbers) were not, therefore, chronologically consecutive. It was also discovered that the books did not represent a complete record; if it were decided to include in the current season's range a line which had previously been produced and later dropped, the recost was frequently done mentally. This, however, was not thought to constitute a major weakness. The staff *thought* the earliest book began in about 1930, while the final entries immediately preceded the first dated volume commencing in 1950.

Any hopes of measuring production at all, therefore, hinged in the first place on the possibility of dating the pre-1950 costings. At first sight this seemed impossible, but on reflection it became clear that there was a key to the riddle in the cost sheet itself, in the shape of an item called ' bonus '. This was a sliding-scale cost-of-living bonus paid throughout the industry and assessed on basic earnings. Changes in the bonus rate could be extracted from the *Labour Gazette*, and it was established that the firm had always paid strictly the agreed rate.

The first part of the exercise, then, consisted in going through all the early cost sheets, adding the labour cost against each operation to give total labour cost excluding bonus, and calculating the bonus rate. Even so difficulties remained. The same bonus rate sometimes ruled for more than a year at a time; at other times it oscillated between the same levels at short intervals for two or three years. In these cases a clear division was sometimes apparent between winter and summer wear (from the description of the product or from the material used) and was normally the main method used in separating years. The inconsistent procedure adopted in recosting of course added to the confusion; in some cases the earlier costing had been amended, in others it had been given a new number and treated as a new product. Here reference was made to the sequence of product numbers and the price of the principal raw material, as well as to the bonus rate.

The second difficulty—to break off for a moment—had to do with the method of constructing the price index. Normally individual prices would be weighted by quantities produced (sold or delivered as an approximation) in some period. As already stated, however, these were not available. So even after all the ' deciphering ' referred to above the goal might still elude us—unless one condition were satisfied. If, after taking a representative sample, all prices were found to have moved in the same direction and at roughly the same rate, the question of weighting could be ignored and a simple average of price relatives would yield a tolerably good index. This was our only chance. If, on the other hand, it happened that products that were changing greatly in relative importance (*i.e.* as a proportion of total output) were also undergoing price changes materially different from the average, the matter of weighting could not be overlooked.

After they had all been dated, the prices were classified according to *type* of product, and the series for 11 types (in representative sizes) were selected as being sufficiently reliable and representative of the whole production. In terms of our earlier remarks about number of lines manufactured, while this exceeded 500 in some years and was as great as 800, there were never more than about 20 different product types as we defined them. In most years both numbers were considerably smaller.

Prices within each of the 11 product types were averaged for each year and expressed as relatives. These were then graphed and found to exhibit a reasonably similar trend over the whole period 1930–50s: the index numbers for the latest year, to base 1939, ranged from about 250 to 290. We concluded on this showing that the series could be averaged to provide a price index.

A final difficulty, minor in relation to those already discussed, was that some prices (for the season preceding the closing of the firm's accounts) strictly needed to be lagged; the gap between setting of prices and commencement of deliveries ranged from nil to about three months. Also deliveries on some large orders were spread over many months, quite possibly spilling over from one financial year to the next. It was not possible with the information at our disposal to cope with this problem at all satisfactorily throughout the greater part of the period.

It has been said that in productivity study the measurement of production presents much more of a problem than measurement of input. This, however was not borne out by the experience here recorded. Our second illustration of working in the dark, then, concerns labour input. The only information the firm itself could provide was weekly employment from 1950. Before that only the odd figure was available—*e.g.* as when a new director joined the Board or the legal status of the firm changed—back to the 1920s. Obviously, in the circumstances, we could give scant consideration to such niceties as hours actually worked, the age/sex composition of the work force, differences in skill, and so on.

Then began a prolonged search for employment data for the period 1930–39 (the years 1940–45 were excluded for the reason given later). The Factory Inspectorate and Ministry of Labour were tried without success. The Board of Trade were able to supply average figures by quarters starting with the final quarter of 1946, showing men and women separately. With the firm's consent also the Office of the Census supplied, from returns to the Import Duties Act Inquiries, monthly figures (one week in each month) for calendar 1935 and 1937, classified according to age, sex and into operatives and others.

The trade association could offer figures only from 1946. Three other possibilities tried were the Federation of British Industries, the local Chamber of Commerce and the industry's research association—it being thought that it might have been possible to derive employment from the firm's subscriptions to these organisations even if a return of actual numbers employed had not been made. But in each case subscriptions were either lump sum, or assessed on some other basis than employment, or related to an employment bracket.

Finally we turned our attention back to the firm's accounts to see whether there was any item of expenditure which varied directly with employment, and through which the latter could be derived. Deflation of ' Wages ' and ' Salaries ', even if it had been possible, offered no solution. While formally this method of calculating productivity (*i.e.* inverse unit costs, expressed in *real* terms) avoids circularity (or non-independence),[1] it would be extremely difficult, for a number of reasons apart from weighting, to construct a deflating index which would satisfactorily wring out all the value elements from the figures.

Such a procedure could not in any case have been used for measuring labour input in this firm, as the great majority of operatives were paid by the ' piece '. If *all* had been paid on this basis deflation of earnings would have yielded a measure of *output* directly. This, however, would not have been admissible either, because it would have assumed, *inter alia*, that the basis of the piece-rates had not been altered—otherwise an easing (tightening) of rates would be reflected as an increase (decrease) in output. The latter was known to have occurred on occasion, notably when faster machines were installed. There would have been a further difficulty in that only part of pieceworker's earnings was directly related to their output, the rest being made up of the cost-of-living bonus.

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[1] As referred to by the late Dr. L. Rostas in connection with wages at *current* prices, see '*Comparative Productivity in British and American Industry*', 1948, p. 5, section 4. The fact that his remarks refer to international comparisons is of no consequence.

One item in the accounts, however, did seem to offer a possible solution, *viz.*, National Insurance contributions, which were shown as a separate item, and this approach was successful. The method was as follows. A list of all the changes in contribution rates during the period was compiled with the help of the Ministry of Pensions and National Insurance. These rates comprised both employer's and employees' contributions (health and pensions and unemployment insurance before July 5th, 1948, thereafter National Insurance, including Industrial Injuries). The joint contribution would be co-extensive with the sums shown in the accounts. since it is the usual practice to record wages and salaries net.

From the list of rates (those for adult males and females only were taken, it having been established that the proportions of juveniles had not varied very much), a weighted index was prepared and used to express the annual payment in real terms. The proportions of males and females were known and constant for two prewar years. It was assumed that these proportions (with slight adjustment) ruled throughout the 'thirties ; no guidance was available in respect of the War years, when the proportion would have differed significantly, so employment figures for 1940–45 were not attempted.

Application of this index of rates to the annual payments would give a measure of labour input in terms of 'equivalent men,' counting a female worker as equivalent to about four-fifths of a male—the ratio of their respective contribution rates. It would also make some, though not necessarily exact, allowance for unemployment and short-time working, the error depending on the firm's policy throughout the period with regard to organised short-time.

When the index of 'equivalent men' was compared with actual employment (men and women counted equally) in 1935 and 1937 (from the IDAC returns) the two were found to bear precisely the same relation to each other in both years. This suggested that the item 'National Insurance' in the accounts contained some extraneous expense, such as a transfer to a private pension or insurance fund, which moved in parallel with employment. Inquiry in the firm confirmed this belief. On the basis of the fixed relationship in these years we then proceeded to estimate average employment for the remaining prewar years.

It may well be asked whether this procedure was justified, based as it was on a relationship established in only two years. Certainly three years would have been much more conclusive, but reliable figures of *average* employment throughout the year were available for only two. What convinced us, however, that the method yielded tolerably good estimates was the fact that it worked for the other firm as well; for the firm discussed here the figures (for 1935 and 1937, respectively) were .593 and .594, while for the first firm they were .265 and .271.

From the foregoing, readers may have built up a picture of a small, ramshackle firm whose administration was grossly inefficient. If so they would be greatly mistaken. It is true that a great deal of importance was never committed to paper—this continues even to the present time—there was no elaborate organisation and only a very rudimentary system of costing; indeed the *financial* accounts were still kept outside the firm by a practising accountant. Yet in the matter of unit costs and relative profitability—not to say labour productivity, but labour was a relatively unimportant element in its cost structure—this firm was equal to the most efficient in the industry. Without recourse to the capital market it had during these 25 years risen from obscurity to become one of the largest in the trade, in terms of numbers employed.

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A 'HUMAN NEEDS' DIET, AUTUMN, 1958

By T. Schulz

The data for computing the cost of a 'human needs' diet in the autumn of 1958 were obtained by us in October, in shopping districts frequented by working-class housewives in London, Birmingham, Reading, Oxford, Newbury, Slough, High Wycombe, Banbury, and Abingdon. The dietary and the figures of cost are shown in the Table. We found that the total weekly outlay required for a family consisting of two adults and three children of school age, amounted to 73s. 11d., which—in spite of a decline in the prices of vegetables and of milk—was only 6d. less than the cost of an equivalent diet in April 1958. However, the prices of certain other foods had gone up, and some adjustments have been made in the dietary to allow for this. No change has been made in the average price for meat, although beef was dearer in the autumn than it had been in the spring, especially roasting beef. Pure minced beef could still be purchased for from 2s. 6d. to 2s. 9d. at inexpensive shops and market stalls, while pork, mutton, and lamb, of reasonable quality, was offered at from 1s. 10d. to 2s. 10d., and the result of the relative scarcity of beef was—and was bound to be—that on the average, everyone obtained less of it.

Nevertheless, from the view-point of the housewife the main adjustment required in order to keep her food expenditure down to the 'human needs' level was probably with respect to the choice of meat. Fat boiling bacon was inexpensive and in some places could be obtained at between 8d. and 1s. a lb. The prices for the best cuts of bacon were fairly high. It will be noticed that our autumn dietary includes less fresh milk than did the April dietary, but, conversely, more skimmed tinned milk, and this although fresh milk cost ½d. a pint less in October than in April. The change actually increases the total allowance of milk in the dietary by 1¾ pints; it was made because the inclusion in the dietary of 3 lb. cooking apples would probably result in the family eating more pastry and fewer milk puddings. Tinned milk seems in practice to be consumed mainly in drinks that require sugar and rarely in milk puddings, and—in terms of milk of normal concentration—more per cup is generally used of condensed milk than of fresh milk. Four tins of skimmed condensed milk represent approximately 7½ pints of skimmed fresh milk, plus 1 lb. 6 oz. of sugar. The larger consumption of milk would about compensate for the protein lost through the reduction in the allowance of cheese, from 2 lb. to 1 lb. 10 oz.

Our figure of total cost shows at what outlay the diet could be purchased in all the districts visited; most of the figures employed for computing it are not, therefore, strictly minimum prices.[1] Variations in prices were frequent and occasionally indeed striking, between shops catering for the same type of customer and sometimes situated almost side by side. Thus, herrings which one fishmonger offered for 1s. 4d. a lb. were on sale some hundred yards away at 1s. Cheese, in taste undistinguishable from one another, was priced in one shop at 2s. and in another at 2s. 6d. Such differences in prices can clearly exist only because incomes in general are fairly high and steady. Every housewife at all times likes to buy as economically as possible, and if she has to cater on a small income will naturally frequent a shop which she finds inexpensive. Yet a shop that sells some items cheaper than another may well sell some others dearer. But few housewives are now-a-days so short of money that they must search round different shops in order to save every possible penny. Moreover, the belief that the dearer food is also the better food, is often strongly held without being ever put to the test.

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[1] The following are some minimum prices encountered in October 1958: Eggs, at the beginning of October, 2s. 3d. a dozen; by the middle of the month, 3s.; bread, 11d. for the ¾ lb. loaf. Other foods, per lb.: processed Cheddar cheese, 1s. 6d.; rolled oats, 9d.; oatmeal, 8d.; semolina, 9d.; small grain rice, 6d.; pearl barley, 6½d, dried peas and beans, 9d. jam, 1s.; swedes, 3d.; cooking apples, 2d.; potatoes, 3½d. when bought in small quantities, and 3d. when bought by the hundredweight.

We tried to obtain from housewives some indication of the types of food they bought and the adjustments they made when individual prices change. The impression was gained by us—and it can be put forward only as an impression, since no statistically valid test is possible—that price changes of foods that from the housewife's view point are of secondary importance tend to affect the composition of the shopping basket far more often directly than do price increases of foods that for them are of main importance, although a decline in the prices of these latter foods is likely to induce larger purchases of them. For many housewives the foods of main importance appear to be the Sunday joint, bacon, eggs, ready-to-eat breakfast cereals, potatoes, and tea. Of these they like to buy the quantity and the quality—or brand—to which they are accustomed. When the price of any of these foods goes up, reductions in the quantity or changes in the quality are often made rather in the purchases of other foods, the prices of which may have remained unchanged or even declined.

An ever increasing influence appears to be exercised on the choice of foods by television, partly through advertising but largely because the desire to watch television encourages the choice of foods that are quickly prepared or even require no preparation at all. Twenty mothers with young children were questioned at random in the different towns. All had television. Seventeen of them bought ready-to-eat cereals; only one bought rolled oats. Only one of them baked regularly cake at home, and that largely from packeted cake mixtures. Half of the twenty expressed a preference for tinned foods, especially soups and fruit, and for meat pies, sausages, and cooked meats. All these ten watched television regularly, but none of them gave this as an explanation for their choice of foods, which, they said, they bought because their families liked them.

Weekly 'Human Needs' Diet for a Family with 3 Children of School Age

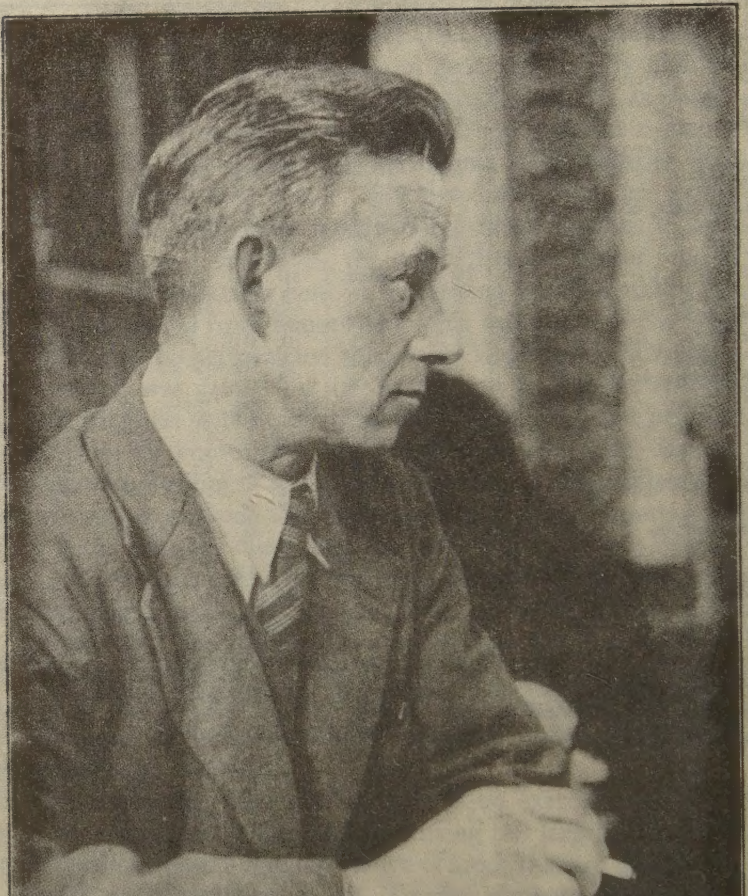
		Autumn 1958		Changes since Spring 1958	
		Quantity	Cost	Quantity	Cost
			s. d.		s. d.
1	Meat	4 ℔	9 4	...	...
2	Bacon	1 ℔	2 6	...	...
3	Herrings	1 ℔ 8 oz.	1 10½	...	+ 1½
4	Eggs	12 eggs	3 6	...	...
5	Cheese	1 ℔ 10 oz.	3 6¼	− 6 oz.	+ 6¼
6	Fresh Milk	14 pt.	9 4	− 2 pt.	− 2 0
7	Skimmed Milk, condensed ...	7½ pt.[1]	3 8	+ 3¾ pt.[1]	+ 1 11
8	Margarine	2 ℔ 8 oz.	3 9	...	+ 4½
9	Dripping	1 ℔	1 2	...	+ 2
10	Bread	19 ℔ 4 oz.	10 6½	...	...
11	Flour	3 ℔	1 7	...	...
12	Rolled Oats	2 ℔ 8 oz.	2 1	...	− 0¼
13	Macaroni	1 ℔	1 0		
14	Other Cereals[2]	1 ℔ 12 oz.	1 5½		
15	Dried Legumes[3]	2 ℔ 8 oz.	2 6	...	+ 2½
16	Sugar	2 ℔ 8 oz.	1 6¾	− 8 oz.	− 3¾
17	Jam (Plum)	8 oz.	7	− 1 ℔	− 1 0½
18	Potatoes	10 ℔ 8 oz.	3 6	...	− 3¼
19	Onions	1 ℔	6	+ 1 ℔	− 1 0
20	Other Root Vegetables ...	7 ℔	2 4		
21	Cabbage	3 ℔ 8 oz.	1 2		
22	Cooking Apples	3 ℔	1 0	+ 3 ℔	+ 1 0
23	Tea	8 oz.	2 4	...	− 2
24	Other Foods and Condiments[4]	...	3 1½	...	...
25	School Milk	5 pt.	free	...	...
	Total Cost		**73 11**		− 6

[1] In terms of fresh milk. One tin is equivalent to approximately 1⅞ pints.

[2] Small grain and flaked rice, semolina, barley.

[3] Peas, beans, lentils.

[4] Including ¼ ℔ of cocoa.



FRANK BURCHARDT

1902 – 1958